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THE REGULATION OF FORENSIC SCIENCE IN ENGLAND AND WALES

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THE REGULATION OF FORENSIC SCIENCE IN ENGLAND AND WALES

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Abstract

Recommendations aimed at preventing criminal justice failings caused by forensic science errors and quality failures have led to the creation of the Forensic Science Regulator's (FSR) role in England and Wales. The FSR role ensures that the provision of forensic science services across the criminal justice system (CJS) is subject to an appropriate regime of scientific quality standards. Despite reports of an increasing framework of quality standards overseen by the FSR, knowledge about the impact of regulation on the quality of forensic services is lacking. The aim of this study was to understand the fitness of the FSR role in improving the quality of forensic service provision from the crime scene to court. Stakeholder reports about the FSR role were analysed and supplemented with 18 semi-structured interviews with participants purposefully sampled from public and private sector Forensic Science Providers (FSPs). The experiences and views of the participants were analysed to interpret the extent to which the FSR role has been impacting the provision of forensic services that reflects the needs of the CJS.

Overall, qualitative findings have shown that even though the FSR role has the potential to improve the quality of laboratory-based forensic practice, it is insufficient if attempting to improve the quality of forensic sciences carried out outside the laboratory setting. Cuts to police budget on forensic science and a consequent interest for cheaper forensic service delivery were seen to dictate the quality of forensic service provision. Criticisms indicate that it is more challenging achieving a forensic service delivery process that is continuously tailored to the needs of the CJS as a whole and not necessarily the demands of a specific forensic customer, because of the financial pressures on FSPs and not necessarily the lack of statutory powers for the FSR role. Concerns emphasise that providing statutory powers for the FSR only to mandate quality standard requirements are overly legalistic and will not drive any changes in quality beyond intensifying accreditation requirements, which will add to the financial pressures which adversely impact the quality of forensic science. Overall, the findings indicate that the lack of adequate funding for forensic service provision creates a gap in the role of the FSR which causes failures to address systemic issues which adversely affect the quality of forensic services. A suggestion is made for the provision of sufficient funding and for increasing the proximity between the FSR role and the management of the forensic marketplace. An increasing focus on quality culture is also recommended to build and improve the ethical and professional values of FSPs.

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"*Praise to the Lord, who doth prosper thy work and defend thee,*

Who from the heavens, the streams of His mercy doth send thee.

Ponder anew

What the Almighty can do,

Who with His love doth befriend thee".

[Joachim Neander (1650-1680)]

Declaration

I declare that the work contained in this thesis has not been submitted for any other award and that it is all my own work. I also confirm that this work fully acknowledges opinions, ideas and contributions from the work of others. Any ethical clearance for the study presented in this thesis has been approved. Approval has been sought and granted by the Northumbria University's Faculty of Business and Law Research Ethics Committee on the 10/04/2018. Ethics reference number: 4503. Journal publications, written evidence to parliamentary inquiries and presentations of the author that were fully or partly derived from this study are presented in Appendix IV.

I declare that the Word Count of this Thesis is **83471** words (excluding bibliography (academic references), footnotes and appendices).

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List of abbreviations

A2LA	American Association for Laboratory Accreditation
ABC	American Board of Criminalistics
ABFT	American Board of Forensic Toxicology
AFSP	Association of Forensic Science Providers
ANAB	ANSI National Accreditation Board
ANSI	American National Standards Institute
ASTM	American Society for Testing and Materials
BBC	British Broadcasting Cooperation
CJS	Criminal Justice System
CPD	Criminal Practice Direction
CPR	Criminal Procedure Rules
CPS	Crown Prosecution Service
CRFP	Council for the Registration of Forensic Practitioners
CSE	Crime Scene Examination
CSFS	Chartered Society of Forensic Sciences
DNA	Deoxyribonucleic Acid
EA	European co-operation for Accreditation
EFSA	European Forensic Science Area 2020
ENFSI	European Network for Forensic Science Institutes
EU	European Union
FCN	Forensic Capability Network
FSAC	Forensic Science Advisory Council
FSP	Forensic Science Provider
FSR	Forensic Science Regulator
FSS	Forensic Science Service
FTS	Forensic Telecommunications Services
IAI	International Association for Identification
ILAC	International Laboratory Accreditation Cooperation
ISO	International Organisation for Standardisation
KFS	Key Forensic Service
LAA	Legal Aid Agency
MPFSL	Metropolitan Police Forensic Science Laboratory

MPS	Metropolitan Police Service
NAS	National Academy of Science
NATA	National Association of Testing Authorities
NBIS	National Ballistics Intelligence System
NCFS	National Commission on Forensic Science
NDNAD	National DNA Database
NFFA	National Forensic Framework Agreement
NFFNG	National Forensic Framework Next Generation
NPIA	National Policing Improvement Agency
OSAC	Organisation for Scientific Area Committees
QMS	Quality Management System
RTS	Randox Testing Services
SDO	Standard-Developing Organisations
SFR	Streamlined Forensic Reporting
SOP	Standard Operating Procedures
STR	Short-Tandem Repeat
SWG	Scientific Working Groups
TFP	Transforming Forensic Programme
UKAS	United Kingdom Accreditation Service
UKIAFT	UK and Ireland Association of Forensic Toxicologists

Chapter 1. Introduction

1.0 The problem statement

Forensic science is the use of scientific techniques or methodologies to investigate, explain or evaluate events of legal relevance.[1] The use of forensic science is a complex end-to-end process, beginning from the crime scene and finishing in court.[2] At different steps of this process, forensic science can be used to provide contributions in the form of actionable intelligence, investigative leads or evidence that may reveal specific information about the investigation, such as identifying and excluding a suspect, confirming a suspect's involvement, or linking crimes based on some recurring trace patterns.[3] Notably, Police rely on scientific support to investigate crime scenes to recover evidential materials, to develop investigative strategies, and to prioritise the submission of evidential materials for further analysis in the laboratory. Different scientific techniques and methods can then be used to analyse physical evidential materials in the laboratory to produce scientific results for use in court.[4] The forensic science process, therefore, entails the production and interpretation of scientific evidence.

When the forensic evidence produced and interpreted does meet some pre-determined scientific and legal standard or requirements, this can help law enforcement agencies to infer behaviour, motivation, and criminal intent. The expectation is that forensic evidence should provide a sound basis for verdicts in criminal courts than the other traditional types of evidence, such as confessions and eyewitness testimony, because of the notion that it provides evidence that is more objective, robust and reliable.[5] Where the initial investigation of cases may have suffered some fundamental defects, forensic science can also be used to assist in reviewing (alleged) cases of miscarriages of justice.

From at least the 1970s onwards, forensic science in England and Wales has come under critical assessment because of some miscarriage of justice cases which were known to have been caused by misleading forensic science or expert evidence. These cases reportedly undermined public confidence in the criminal justice process and triggered many recommendations for a forensic

[1] Jim Fraser, *Forensic Science: A Very Short Introduction* (Oxford University Press 2010), p.5.
[2] Stan Brown and Sheila Willis, 'Complexity in Forensic Science' (2010) 1 Forensic Science Policy & Management: An International Journal 192.
[3] Claude Roux, Frank Crispino and Olivier Ribaux, 'From Forensics to Forensic Science' (2012) 24 Current Issues in Criminal Justice 7; Quentin Rossy and others, 'Integrating Forensic Information in a Crime Intelligence Database' (2013) 230 Forensic Science International 137.
[4] Evgeny Katz, Jan Halámek and Saira Bakshi, 'Forensic Science - Multidisciplinary Approach' (2015) 1 Forensic, Legal & Investigative Sciences 1.
[5] Paul Roberts, 'What Price a Free Market in Forensic Science Services - The Organization and Regulation of Science in the Criminal Process' (1996) 36 British Journal of Criminology 37.

practitioner and/or forensic practice-based regulation as a means to mitigate or minimise forensic science errors in the CJS. Since early 1990, forensic science practitioners had been subjected to some form of external regulation to ensure that forensic science evidence provided in court are of good quality and reliable. However, following expansions and the changing landscape of the forensic science sector, the practitioner-only regulation became weak. A new regulation, the FSR role, was subsequently created in 2007 as an improved model for regulating the quality of forensic service-provision, encapsulating all companies and law-enforcement bodies who provide any forensic service, individual practitioners, and methods for forensic analyses.

Despite this innovation, and the hopes that the seemingly intractable problems with forensic science would now be addressed, forensic service provision has continued to attract criticism; the latest has been that "the quality and delivery of forensic science in England and Wales are [still] inadequate".[6] While questioning the overall system of forensic service delivery, this conclusion also challenges the fit-for-purpose of the FSR role which has been created as the independent regulator of the quality of forensic science services provided by both police force laboratories and private FSPs. The impact of the FSR role on the quality of forensic science is lacking and the information available about the effectiveness of the FSR role is inconsistent with the achievement of the supposed overriding purpose of the FSR role.

1.1 Justification for this study

To date, the series of annual reports by the Regulators who have occupied the FSR role are the key sources of information about the effectiveness of the FSR role. Attempts to assess regulatory effectiveness in these reports display a highly quantitative approach, focusing on the actions of the Regulators, in terms of how they are implementing programmes to fulfil the role of the FSR. The approach, therefore, projects the assumption that the FSR role is effective because the Regulators are developing quality standards, monitoring the accreditation of FSPs and investigating cases of quality failures. Yet, to date, these performance indicators have not provided a cast-iron guarantee of quality forensic services. Rather, recent quality failings in some accredited FSPs have demonstrated the limitations of relying on these indicators as the yardstick of quality forensic science and the respective effectiveness of the FSR role. This study, therefore, identifies the unidimensional nature of the current approach of measuring regulatory effectiveness, raising

[6] House of Lords Science and Technology Select Committee, 'Forensic Science and the Criminal Justice System: A Blueprint for Change' (2019) 3rd Report of Session 2017–19 <https://publications.parliament.uk/pa/ld201719/ldselect/ldsctech/333/333.pdf>, p.3.

questions whether there may be some aspects of the effectiveness of the FSR role that are not, yet, fully explored and understood or being overlooked.

It is noted that monitoring only the actions and the programmes that the appointed Regulators develop to fulfil the role of the FSR cannot satisfactorily gauge the effectiveness of the FSR role. This approach does not fully capture the holistic view of the effectiveness of the FSR role, including the impact of the Regulator's programme of work on the quality of forensic services provided by FSPs. This study addressed this gap, exploring the effectiveness of the FSR role from the perspective of its impact on the work of FSPs and not necessarily the programmes being implemented by the Regulator. This was based on the view that if FSPs are required to comply with the Regulator's programmes of work: quality standards, accreditation, and reporting of complaints and quality failures to the Regulator, then this should, in turn, help them to achieve some operational and criminal justice objectives demanded of them. Some requirements of the CJS concerning the delivery of forensic science service by all FSPs were used to gauge the extent to which the Regulator's actions and programme of work are improving the quality of forensic science. This approach suffices the determination of the fitness-for-purpose of the FSR role, scrutinising the effectiveness of the FSR role more closely from its interactions with FSPs, to determine how it is helping to secure public confidence in the quality and reliability of forensic science used in the CJS.[7]

1.2 The purpose of this study

The central research question posed was: "is the role of the Forensic Science Regulator in England and Wales fit for purpose: thus, improving the quality of forensic service provision from the crime scene to court?" The study approach was phenomenological, based on the view that the intentional experiences and perspectives of individual FSPs who work under the FSR and are affected by regulatory requirements and interventions are crucial to understanding the FSR role and its impact. The qualitative experiences and views of a diverse group of FSPs were able to achieve the aim of this study. Through the four supplementary research questions/objectives below, this study sheds light on the essence of FSR role and some foreseeable impact of the proposed reform to the FSR role. The study also makes some recommendations for enhancing the FSR role and its effort in improving the quality of forensic science.

[7] Andrew Rennison, 'The Forensic Science Regulator Business Plan 2008/09 - 2010/11' <https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/118922/Forensic_Science_Regulator_3.pdf> accessed 5 February 2018.

1.2.1 Research Questions

1. What structural and contextual factors impact upon the FSR role and affect the operations of the Regulator?

The objective was to examine the fitness of the institutional framework of the FSR role and the overall system of forensic science service provision designed to fulfil the aims of the regulation, to determine whether they support a successful operation of the Regulators. The focus was to identify the strengths and weaknesses of the Regulator. This objective was achieved through both the analysis of the FSR annual reports and other stakeholder reports and interviews with participants.

2. To what extent have regulatory requirements and interventions impacted the quality of the work of forensic science providers?

The objective was to assess the effectiveness of the regulator's programme of work in helping and enhancing the ability of FSPs to meet the requirements of the CJS concerning the delivery of forensic science services. Both positive and negative impacts of the regulator's programme of work and other non-regulatory factors, such as the commercialisation of forensic service-provision, on the work of FSPs, were determined through document analysis and the experiences and views of participants.

3. What changes could the FSR Bill bring to the regulation and the quality of forensic science service provision?

The objective was to assess any foreseeable impact that the proposed statutory regulatory powers for the FSR role could have both on the work of the Regulator and the quality of forensic services provided by individual FSPs. This was achieved through interviews with participants.

4. What are some potential regulatory practices for improving the model of the FSR?

The objective was to explore some potential practices that could be recommended to improve the effectiveness of the FSR role, by aligning the operations of the Regulator with the purpose and the interests of the FSR role. This objective was achieved through the views of participants.

1.2.2 Structure of the Thesis

This thesis consists of eight chapters. Chapter one provides the background to this study, including the research questions and the purpose of this study. Chapter two considers the different approaches of regulating the provision of forensic science services, including the model of the FSR role. The

rationale for the introduction of the FSR role and the motives for the commercialisation of forensic service provision are captured. Chapter three begins the process of assessing the effectiveness of the FSR role. The relationship between the FSR role and the quality of forensic science is explored through extensive search and analysis of forensic science stakeholders' reports about the FSR role. In addition to providing valuable preliminary information about the FSR role, the document analysis identifies the gaps which informed the fieldwork data collection. Chapter four explores the relevant literature to gain insight into the theoretical underpinning and the methodological approaches for determining the impact of quality assurance programmes and regulation on the quality of forensic services. A conceptual framework is developed from the literature review to assess the effectiveness of the Regulator's programme of work. Chapter five details the fieldwork methodological procedures. The results, discussion, and the conclusion and recommendations of the study are captured in Chapters six, seven and eight, respectively.

Chapter 2. Approaches to the regulation of forensic science: a general perspective

2.0 Regulation: motives and justifications

Regulation is an unwieldy concept and difficult to define. This is because the motives and justifications for different types of regulation vary. However, irrespective of these differences, it is customary that regulations will be introduced for a body or an agency (Regulator) to exercise control over some activities that are valued by a community,[8] to achieve a certain desired result(s)—most commonly to solve, or at least reduce or ameliorate, a problem associated with the valued activity.[9] The Regulator will exercise control by using some instrument(s), such as legal and non-legal rules.[10] One common rationale for regulation is the market-failure type where regulation will be introduced on the basis that an uncontrolled marketplace will fail to produce some behaviour or results in accordance with the public interest.[11]

However, there are also different circumstances where regulation will be justified by other motives, one of which is the need to control the risks associated with the activities of organisations. This type of regulation is known as risk regulation.[12] Risk signifies the probability of a danger occurring and the consequent severity of the impact of that danger.[13] Therefore, the purpose of risk regulation will be to either control the causes of risks, by using strategies that can minimise the production of risks, or mitigate the adverse impact of the risk. This type of regulation is different from risk-based regulation, which is a process of regulation where regulatory actions are prioritised according to the assessment of risks that the regulated organisations present to the regulator's achievement of goals.[14] Thus, in risk-based regulation, risks are not necessarily the primary motive of regulation as they are in risk regulation.

In risk regulation, the dynamics of regulation, such as the appropriate institutions, regulatory strategies and interventions to mitigate risks are fundamentally shaped by the work culture of organisations and how risks are known or perceived within this culture.[15] The strategies adopted

[8] Kjekshus Lars Erik and Veggeland Frode, 'State Regulatory Capacity: Experiences from Public Sector Reforms in Norway' (2011) 89 Public Administration 1568.
[9] John Braithwaite, Cary Coglianese and David Levi-Faur, 'Can Regulation and Governance Make a Difference?' (2007) 1 Regulation & Governance 1.
[10] Roger Brownsword and Morag Goodwin, *Law and the Technologies of the Twenty-First Century; Text and Materials* (Cambridge University Press 2012), pp.24 – 25.
[11] Robert Baldwin, Martin Cave and Martin Lodge, *Understanding Regulation: Theory, Strategy, and Practice* (2nd edn, Oxford University Press 2012), pp.281 – 295.
[12] Baldwin, Cave and Lodge (n 11). pp.83 – 102.
[13] Baldwin, Cave and Lodge (n 11), p.83.
[14] Baldwin, Cave and Lodge (n 11).
[15] Cary Coglianese and David Lazer, 'Management-Based Regulation: Prescribing Private Management to Achieve Public Goals' (2003) 37 Law & Society Review 691.

will focus on the organisational dimension of risk control by placing much responsibility on the regulated organisations to manage risks. However, the difficulty is that risks can be difficult to identify. While some risks may be caused by unintended activities, in some cases, risks can be inevitable because of the inherent complexity of organisational processes, such as encountered in high-reliability organisations.[16] High-reliability organisations are organisations that operate in a hazardous and complex environment where the expectations and consequences of risks and harm are high, but they try to manage them.[17]

Organisations that provide services in the public interest, such as in the health care sector and the justice system, can be subjected to some form of risk regulation, because of the severity of consequences of failures or mistakes happening. Organisations who work in these sectors will be directed to follow certain rules, mostly to implement mechanisms and place resources into error-prone areas to reduce the potential of risks occurring. The instruments for regulation can be typically framed as a choice between technology or performance, where the regulator would rely on rules that either mandate specific technologies to be used or require that certain outcomes be achieved or avoided.[18]

2.1 Forensic science regulation: motives and justifications

Organisations who provide forensic science services, herein referred to as FSPs, are classified as high-reliability organisations, because of a high potential for errors to occur at any stage of their process of providing forensic services.[19] The errors that occur can have serious ramifications on forensic service users (the CJS), including wrongful convictions or miscarriages of justice. This can lead to public distrust in the use, quality and reliability of forensic science. Therefore, a high degree of the rationale for regulating the provision of forensic services is characterised by this notion of the severe consequences that errors or mistakes in forensic science can or do pose to the CJS. The opportunities for errors to occur are enormous; they include contamination of evidence, misconduct and negligence of forensic science practitioners, misrepresented or exaggerated test and analytical results, misinterpretation of test and analytical results, lack of research for basic assumptions in interpreting forensic evidence, unqualified analysts, and inconsistent laboratory

[16] Baldwin, Cave and Lodge (n 11), pp.93-98.
[17] David P Baker, Rachel Day and Eduardo Salas, 'Teamwork as an Essential Component of High-Reliability Organizations' (2006) 41 Health Services Research 1576.
[18] Baldwin, Cave and Lodge (n 11), p.83.
[19] Max M Houck, 'Risk, Reward, and Redemption: Root Cause Analysis in Forensic Organizations' (2016) 7 Forensic Science Policy & Management: An International Journal 106.

practices.[20] Thus, the risks of errors occurring in forensic science could come from the collection and preservation of evidential materials; scientific analysis and testing of evidential materials and/or the interpretation of the resulting evidence.[21]

Mostly, the errors and/or the impact of errors in forensic science may be identified through post-conviction case reviews, appeal processes or systematic studies, by which time some (irremediable) damage may have already been caused.[22] As a result, relying on the post-conviction processes alone to correct the risks of wrongful conviction caused by unreliable forensic science does not prevent the cause of mistakes in forensic science, but they are rather thought to "simply put a Band-Aid on a gaping wound".[23] Therefore, due to the unforgiving social and political environments that forensic science and FSPs operate within, and the use of complex processes and technologies, FSPs are regulated to ensure that the risks of quality failures can be brought to a low tolerance level.[24] The idea is to regulate throughout the stages of forensic science service provision, from the crime scene to court. This is to ensure that each forensic discipline, technique or method used is methodologically robust in its application, at every stage of the forensic process; that the support it provides in the form of scientific evidence will address legally pertinent issues, and be communicated in a way that makes its value transparent and intelligible to forensic evidence and service users.

However, given that forensic science is at the interface of law and science disciplines, this creates a matrix of interactions and complexities concerning the understanding and regulation of risk-causing activities. The complexities emanate from the many disciplines, institutions, corporate and individual actors, which encompass policing, justice, research and policy that operate under the umbrella of forensic science.[25] Another dimension of complexity concerns the different stages of the process of forensic science service delivery by FSPs, which present many opportunities for errors and quality failures to occur, such that something compromised at one stage, could result in serious ramifications for the entire case under investigation.[26] In line with these complexities, the frameworks for regulating forensic service provision do vary. The benefits of the different regulatory frameworks are bound up by their appeal for 'quality assurance', vital to ensure that

[20] Jessica D Gabel, 'Realizing Reliability in Forensic Science from the Ground Up' (2014) 104 Journal of Criminal Law & Criminology; Chicago 283.
[21] Jon B Gould and others, 'Predicting Erroneous Convictions' (2013) 99 Iowa Law Review 471.
[22] Nadine M Smit, Ruth M Morgan and David A Lagnado, 'A Systematic Analysis of Misleading Evidence in Unsafe Rulings in England and Wales' (2018) 58 Science & Justice 128.
[23] Gabel (n 20).
[24] Houck (n 19).
[25] RM Morgan, 'Forensic Science Needs Both the "Hedgehog" and the "Fox"' [2018] Forensic Science International <http://www.sciencedirect.com/science/article/pii/S0379073818305474> accessed 5 October 2018.
[26] Brown and Willis (n 2).

forensic science is, and remains, fit for criminal justice purpose.[27] This chapter explores the different approaches of regulating forensic science, as shown in Figure 2.1 below. It concludes by placing the role of the FSR in the context of these different approaches.

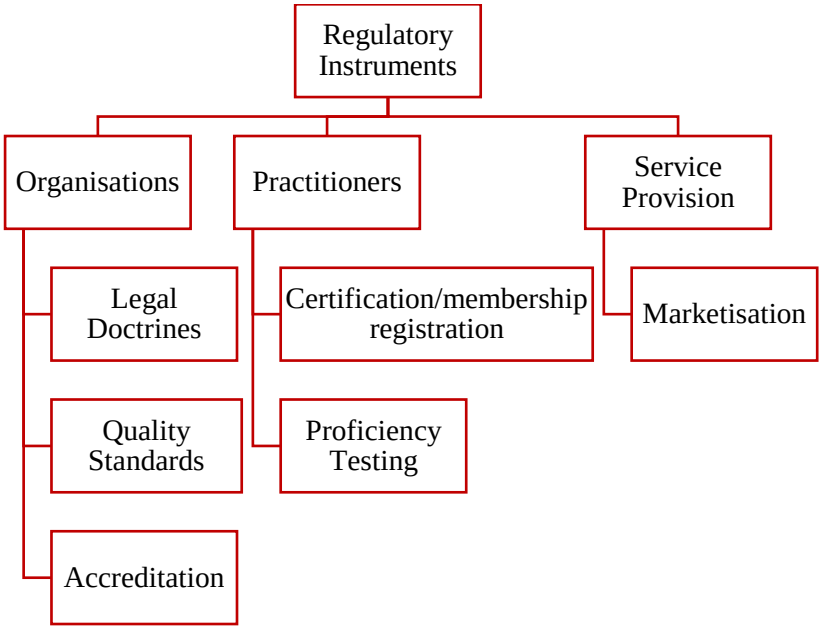

Figure 2.1. Approaches to regulating forensic service-provision.

2.2 Legal doctrines

It is hoped that the legal constraints in which forensic science operates, such as some adversarial legal doctrines, should provide some safeguards for higher quality and the reliability of forensic services. Most commonly, these legal doctrines are used to 'regulate' the admission of forensic expert evidence at the point of use in court. Across different countries, the legal framework that governs the admission of forensic evidence has been triggered or reformed by the awareness of junk forensic science and unreliable expert testimony and their impact on convictions. The legal frameworks, thus, place a gatekeeping responsibility on the court to determine the admissibility of forensic science evidence in court, after subjecting it to some form of standards or test criteria. Standards refer to something used as a measure, norm, or model in comparative evaluations. They are set by experts in a particular field who know the needs of the organisations they represent.[28]

[27] Paul Roberts, 'Making Forensic Science Fit for Justice' (2017) 49 Australian Journal of Forensic Sciences 502.
[28] 'ISO 9000:2015, Quality Management Systems — Fundamentals and Vocabulary' <https://www.iso.org/obp/ui/#iso:std:iso:9000:ed-4:v1:en:term:3.10.1> accessed 24 June 2020.

In common law jurisdictions, such as the England and Wales, the admission of expert forensic evidence is subject to the criteria of assistance, relevant expertise, impartiality and evidentiary reliability. Thus, to be admissible, the expert evidence must, first, be able to provide information which is likely to be outside a judge or jury's knowledge and experience, but it must also give the court the help it needs to form its conclusions about the case in question.[29] Secondly, the individual claiming expertise in a forensic discipline must be an expert in the relevant field, such as acquired by study or experience sufficient knowledge of the subject to render an opinion of value.[30] Thirdly, the expert must be able to provide impartial, objective evidence on the matters within his or her field of expertise.[31] Finally, the expert's evidence must satisfy a threshold of acceptable reliability. This means that the expert's field of expertise must at least be sufficiently well established, such as whether the subject matter of the expert's opinion forms part of a body of knowledge or experience which is sufficiently organised or recognised to be accepted as a reliable body of knowledge or experience.[32]

In the US, the literature notes the *Frye* test as the trailblazer standard for the admission of scientific evidence.[33] Established in the case of *Frye v. United States*, the court established that to be admissible in court, scientific evidence must be sufficiently established to have gained 'general acceptance' in the particular scientific community in which it belongs. Yet, this test was criticised because it was opened to different interpretations concerning what comprises a 'relevant scientific community' and a 'general acceptance'. This is reported to have caused problems, where by applying this test, this led to the exclusion of some relevant, probative evidence which could have helped the court to administer justice.[34] With this limitation, a new standard, the *Daubert* Standard, was established in the case of *Daubert v Merrell Dow Pharmaceuticals, Inc*. in 1993. Under the *Daubert* Standard, the expert's scientific evidence must satisfy the criteria of 'reliability' and 'relevance' to be admissible in court. The implication is that the reasoning or methodology underlying the experts' testimony should be both scientifically valid (reliable) and should properly apply to the facts in issue in question (relevant).[35] However, the drawback of *Daubert* was that it was limited to only 'scientific evidence'. As a result, the criteria for admissibility has been extended

[29] *R v Turner*, [1975] QB 834.
[30] *Bonython*, [1984] 38 SASR 45.
[31] *Field v Leeds City Council*, [2000] 1 EGLR 54.
[32] *Bonython*, [1984] 38 SASR 45.
[33] Henry F Fradella, Lauren O'Neill and Adam Fogary, 'The Impact of Daubert on Forensic Science' (2003) 31 Pepperdine Law Review 323.
[34] Fradella, O'Neill and Fogary (n 33).
[35] Paul C Giannelli, 'Daubert and Forensic Science: The Pitfalls of Law Enforcement Control of Scientific Research' (2011) 2011 University of Illinois Law Review 53.

in the case of *Kumho Tire Co. v. Carmichael* to encapsulate expert testimony that involves either scientific, technical or other specialised knowledge.[36]

The test criteria for the admissibility of expert evidence in the US and the England and Wales share some similarities, in terms of their quest for evidence that is supported by sufficiently reliable scientific knowledge and can assist the court's trier of fact. However, the court's ability to understand or determine these issues has been a subject of criticisms by legal scholars. These criticisms highlight the limitations of legal doctrines to safeguard the CJS from misleading and unreliable forensic science. It is argued that even though the court can decide whether the expert's evidence applies to the facts at issue, the court is not the right jurisdiction to critique and determine that an expert's opinions are based on relevant scientific methods, processes, and data.[37] Prompted by concerns that expert opinion evidence was being admitted in criminal proceedings too readily, with insufficient scrutiny, the Law Commission in England and Wales proposed a statutory reliability-based admissibility test, to bolster the weaknesses in the common law admissibility criteria.[38] This proposal was rejected by the government, based on the cost of implementing a statutory test. Yet, some of the recommendations by the Law Commission have informed some amendments in the rules concerning the admissibility of expert evidence (CPR Part 19, to be discussed later).

Nevertheless, legal experts continue to offer recommendations on how 'sufficient reliability' of forensic expert evidence could be interpreted, criticising that case laws concerning the test for 'sufficient reliability' of expert evidence are scarce.[39] Overall, these criticisms point to the weakness of legal doctrines and the non-scientific community to provide a foolproof safeguard for science-based issues which negatively affect the administration of justice. Primarily, it is the lack of technical flexibility and time constraint during case adjudication in court, that limits legal doctrines at scrutinising the science underpinning forensic expert evidence, such as the routine practices in laboratories which precede expert evidence in courts.[40] It is even thought that some enhanced admissibility standards from common law rules will not be effective in guaranteeing the

[36] Fradella, O'Neill and Fogary (n 33).
[37] Paul C Giannelli, 'Wrongful Convictions and Forensic Science: The Need to Regulate Crime Labs' (2007) 86 North Carolina Law Review 163.
[38] The Law Commission, *Expert Evidence in Criminal Proceedings in England and Wales, (LAW COM No 325).* (2011) <https://s3-eu-west-2.amazonaws.com/lawcom-prod-storage-11jsxou24uy7q/uploads/2015/03/lc325_Expert_Evidence_Report.pdf> accessed 26 January 2018.
[39] Tony Ward, 'Explaining and Trusting Expert Evidence: What Is a "Sufficiently Reliable Scientific Basis"?' [2020] The International Journal of Evidence & Proof 1365712720927622.
[40] Giannelli (n 37).

quality of scientific evidence because they are rather generic, typically addressing 'expert evidence' rather than 'forensic science'.[41]

According to Roberts[42], it is highly unlikely that a single regulatory solution would be capable of addressing all, or even most, of the diverse concerns in forensic science, because solutions to certain problems might simultaneously create or exacerbate other tensions elsewhere in the complex interdependent nature of the CJS. As a result, mechanisms targeted at organisations who provide forensic science services, in combination with procedural safeguards in court, are recommended to complement legal doctrines to improve the scrutiny, testing and rational evaluation of the scientific and methodological basis of forensic science. Regulating at the production process point of forensic science service, by establishing science-based quality standards, ethical standards and proficiency testing for practitioners, and standards for the interpretation of scientific results are some of the proposed means for managing the risks of forensic science quality failures. The intention is that science-based regulation will lead to improvements in the quality of forensic science services and expert evidence, as well as the mitigation and minimisation of the risks of quality failures by FSPs.[43]

2.3 Quality standards

According to the International Organisation for Standardisation ISO, quality signifies the degree to which a set of inherent characteristics of an object (product, service, process, system) fulfils requirements.[44] The requirements are the needs or expectations that are stated, generally implied or obligated by interested parties. Quality standards, therefore, refer to the level of attainment of quality of a product, process or service that is thought to be acceptable or meet certain requirements.[45] In the provision of forensic science services, the commonly recognised standards, globally, are the international standards ISO/EC 17025:2017 and the ISO/IEC 17020:2017. The ISO/EC 17025:2017 outline the general requirements for forensic science testing and analysis in the laboratories, while the ISO/IEC 17020:2017 outline the requirements for the examination of crime scenes and inspection works. Both standards are a set of requirements used to communicate the levels of performance that are expected from FSPs. However, the challenge is that these standards are not specific for forensic science service provision but are rather generic for

[41] Roberts, 'Making Forensic Science Fit for Justice' (n 27).
[42] Paul Roberts, 'Paradigms of Forensic Science and Legal Process: A Critical Diagnosis' (2015) 370 Phil. Trans. R. Soc. B 20140256.
[43] Randolph N Jonakait, 'Forensic Science: The Need for Regulation' (1991) 4 Harvard Journal of Law & Technology 109.
[44] 'ISO 9000:2015, Quality Management Systems — Fundamentals and Vocabulary' (n 28).
[45] 'International Organisation for Standardisation (ISO) - Standards' (*ISO*) <https://www.iso.org/standards.html> accessed 23 June 2020.

organisations that perform testing and calibration and inspections, respectively. As a result, these standards do not cover certain operational procedures in forensic science, such as interpreting and reporting scientific evidence in court. This means that obtaining standardisation, consistency, and a common approach to these procedures may be problematic. Therefore, quality standards that are specific for forensic science are required to ensure that forensic procedures are performed in a unified approach to common standards.[46]

The International Laboratory Accreditation Cooperation (ILAC) has provided a guidance document for FSPs which explains how the ISO/IEC 17025:2017 and ISO/IEC 17020:2017 standards apply to forensic science processes within laboratories and scene of crime investigation.[47] This document, known as the 'ILAC G19:08/2014 Modules in a Forensic Science Process' has been prepared through other guidance documents based on the ISO standards that have been prepared by the European co-operation for Accreditation (EA) and the European Network of Forensic Science Institutes (ENFSI). It is, therefore, to some extent representative of and recognised by the forensic science community, at least in Europe. Again, the ISO through its Technical Committee ISO/TC272 develops international standards that pertain to laboratory and field-based forensic science techniques and methodologies in broad general areas, such as the detection and collection of physical evidence, the subsequent analysis and interpretation of the evidence, and the reporting of results and findings.[48]

In addition to these forensic science standards, there are regional and national bodies who establish standards for forensic science. In the USA, the American Society for Testing and Materials (ASTM International), through its Forensic Standards Committee E-30 develops standards for the collection, preservation, scientific examination, preparation and reports relating to physical evidence for forensic purposes; and the general practice of forensic science.[49] In Australia, a core framework of forensic science standards that covers crime scene examination processes; analysis; interpretation; and reporting of forensic evidence has been developed. These core standards reflect the central value chain of the forensic processes that are common across all disciplines and are intended to be the blueprint on which discipline-specific standards can be developed.[50]

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[46] James Robertson, Karl Kent and Linzi Wilson-Wilde, 'The Development of a Core Forensic Standards Framework for Australia' (2013) 4 Forensic Science Policy & Management: An International Journal 59.
[47] 'The International Laboratory Accreditation Cooperation (ILAC)' <https://ilac.org/about-ilac/> accessed 24 June 2020.
[48] 'ISO Technical Committee ISO/TC 272 - Forensic Sciences' (*ISO*) <https://www.iso.org/cms/render/live/en/sites/isoorg/contents/data/committee/43/95/4395817.html> accessed 24 June 2020.
[49] 'The American Society for Testing and Materials, Committee E30 on Forensic Sciences' <https://www.astm.org/COMMIT/SCOPES/E30.htm> accessed 23 June 2020.
[50] Robertson, Kent and Wilson-Wilde (n 46).

Studies have looked at the history and the sources of both international and national standards for forensic science service provision.[51] While appreciating the need to have internationally applicable and authoritative standards for forensic science, studies have criticised the relatively complex nature of the current picture at the global, regional, and national level, in terms of the activities of standard-developing organisations (SDOs), and the relationships between such bodies and their work outputs.[52] At the ISO technical committee level, it is reported that the agreement to terminologies and the understanding of the meaning of standards become problematic between member countries. Even though the purpose is to develop international standards that can be achieved by FSPs at a particular point in time, it is reported that some input from member countries does suggest that they either want the standards to be 'gold standard' to drive an unrealistic change in the short term, or they want it too minimal so that it can drive no change.[53]

Also, a common limitation of the numerous forensic science standard documents is that they do not specify the methods, procedures or processes that should be used to carry out forensic science activities.[54] Rather, Scientific Working Groups (SWGs) in individual countries and regions (such as Europe) develop the guidelines and practice protocols for carrying out specific forensic science tasks, such as testing and analysis across different forensic science disciplines. However, SWGs also face some challenges like the SDOs, such as the inconsistencies in their operation and failures for some guidance documents to be accepted as representing the experience of the entire forensic science community.[55] In the USA, an attempt to address inconsistencies and promote standardisation in forensic science standard documents has led to the creation of the Organisation of Scientific Area Committees (OSAC).[56] The OSAC aims to populate a registry of consensus-based standards and guidance protocols for forensic science. Since 2014, almost all the SWGs in the USA have been subsumed under OSAC. In Europe, the ENFSI has different Expert Working Groups who develop guidelines and practice protocols for carrying out different activities across different forensic science disciplines.

Another challenge faced by international, regional and national SDOs and SWGs is that these bodies have no authority to enforce their standard and guidance documents because their

[51] John J Lentini, 'Forensic Science Standards: Where They Come From and How They Are Used' (2009) 1 Forensic Science Policy & Management: An International Journal 10.
[52] Linzi Wilson-Wilde, 'The International Development of Forensic Science Standards — A Review' (2018) 288 Forensic Science International 1.
[53] Wilson-Wilde (n 52).
[54] Robertson, Kent and Wilson-Wilde (n 46).
[55] John M Butler, 'U.S. Initiatives to Strengthen Forensic Science & International Standards in Forensic DNA' (2015) 18 Forensic Science International: Genetics 4.
[56] 'The Organization of Scientific Area Committees for Forensic Science' <https://www.nist.gov/topics/organization-scientific-area-committees-forensic-science> accessed 24 June 2020.

documents are not legally binding. Thus, even though these standards may be developed by consensus, they are applied by FSPs voluntarily, by choice or per arrangements that exist in individual countries or jurisdictions. The standards and guidance documents are used for the accreditation of FSPs to demonstrate that the activities of FSPs conform to specific standard requirements. This is intended to demonstrate to stakeholders, including the CJS that forensic systems and processes follow a standard methodology. In turn, it is hoped that this will help stakeholders and forensic service users to determine whether forensic science results are accurate, reliable, or meaningful in the context of the case they are used for.[57]

2.4 Accreditation

Accreditation refers to a third-party or external body's recognition that the quality management systems and technical procedures that operate within a facility that provides forensic science services conform to some required quality standards.[58] It is also a means of demonstrating that these standards will be adhered to by the facility. Accreditation bodies receive their authority from relevant law enforcement or regulatory agencies concerning forensic science and are themselves accredited. Generally, for FSPs to be accredited, a team of personnel who have systems and technical expertise conducts an on-site inspection to assess whether the systems, methods, policies and procedures of individual FSPs meet the criteria within the scope of ISO/IEC 17025 or ISO/IEC 17020 and any relevant field-specific quality standards. Any anomalies (non-compliances) detected during the inspection and assessment will have to be rectified before accreditation could be granted.[59]

The design and focus of forensic science accreditation programmes vary across jurisdictions. However, it is common that FSPs will undergo partial and full reassessments on a regular interval, after initial accreditation assessments, to maintain their accreditation. For the ISO/IEC 17025, the accreditation process generally assesses the administrative operation of the FSP, the qualifications of personnel and adequacy of their training, the existence and adequacy of standard operating procedures and the adequacy of the chain of custody for handling evidential materials. The process also reviews the analytical procedures, quality assurance and quality control measures, and

[57] Lentini (n 51).
[58] A Ross and A Davey, 'Accreditation: Forensic Specialties' in Jason Payne-James and Roger W Byard (eds), *Encyclopedia of Forensic and Legal Medicine (Second Edition)* (Elsevier 2016) <http://www.sciencedirect.com/science/article/pii/B9780128000342000021> accessed 12 June 2020.
[59] Ross and Davey (n 58).

procedures for reporting and addressing feedback and complaints.[60] The accreditation of individual FSPs will also vary according to the service(s) they provide, in addition to certain criteria that may be required for discipline-specific forensic science practice and by the accreditation body.

In Australia, the accreditation of forensic science providers is done by the National Association of Testing Authorities (NATA).[61] In the USA, accreditation is conducted by multiple bodies, including the American National Standards Institute (ANSI)-National Accreditation Board (ANAB)[62] and the American Association for Laboratory Accreditation (A2LA).[63] In the UK, accreditation is conducted by the United Kingdom Accreditation Services (UKAS).[64] In general, it is acknowledged that accreditation should provide both internal and external benefits to the accredited FSP. The internal benefits include the provision of an environment where quality is built-in as part of the process of providing services rather than being checked in at the end. This is intended to provide transparency and confidence in the systems, services, and products of a facility, for both management and practitioners.[65] The external benefits include end-users confidence in the reliability of the product or service provided by the accredited FSP. Yet, it is recognised that where FSPs lack external accreditation, this should not automatically cast doubt on the efficacy of the facility, nor the reliability of the results they provide. This is because, there may be many legitimate reasons, not related to the facility's competence, why accreditation may not have been pursued, such as financial reasons.[66] Also, the court may be unlikely to adopt a procedure where only expert witnesses from accredited organisations will be required to give evidence in court, or where evidence from experts from unaccredited organisations will be rejected on the basis of accreditation.

There are criticisms concerning the fitness for purpose of accreditation, including whether it can mitigate the risks that are inherent in the routine practices of FSPs. Some of these criticisms have been explored in this study. It is recognised that while accreditation programmes will only provide the information about the standards and the criteria that FSPs should meet, they do not provide how

[60] GR Jones, 'Accreditation: Toxicology Laboratories' in Jason Payne-James and Roger W Byard (eds), *Encyclopedia of Forensic and Legal Medicine (Second Edition)* (Elsevier 2016) <http://www.sciencedirect.com/science/article/pii/B9780128000342000045> accessed 12 June 2020.
[61] 'National Association of Testing Authorities, Australia' <https://www.nata.com.au/> accessed 24 June 2020.
[62] 'ANAB Forensic Science Accreditation' <https://anab.ansi.org/en/forensic-accreditation> accessed 24 June 2020. In 2016, ANSI-ANAB merged with the American Society of Crime Laboratory Directors/Laboratory Accreditation Board (ASCLD/LAB), to become the main accreditation body for forensic science
[63] 'A2LA, Forensic Examination Accreditation Program' <https://www.a2la.org/accreditation/forensics> accessed 24 June 2020.
[64] 'UKAS: Forensic Science Accreditation' <https://www.ukas.com/sectors/forensic-science/> accessed 24 June 2020.
[65] Ross and Davey (n 58).
[66] Ross and Davey (n 58).

the standards and the criteria should be met. Thus, the individual FSPs choose to design their systems and methods that conform to the standard requirements and in accordance with certain practice protocols within a specific forensic science discipline.[67] For the several documentations on guidelines, procedures and protocols that co-exist in the forensic science community, there is a challenge, then, with determining which methods and procedures adopted by individual FSPs are fit for a specific forensic science purpose, including determining the acceptable error limits of a particular method.

Another debate, therefore, is whether accreditation ensures acceptable, error-free forensic science practice. Across the forensic science community, it is not uncommon to find criticisms that accreditation cannot guarantee that mistakes will not happen, and bad practice will not creep in the practice of individual FSPs. This is because of the notion that accreditation only provides a snapshot of a laboratory's operations at a specific point in time and does not and/or cannot guarantee that the quality of work would be produced at the same level of standard.[68] However, what is claimed to be certain is that where accreditation is maintained over a period of several cycles, this should ensure that a minimum standard of practice is established and that methods are properly documented, properly performed, and reliably reported.[69]

2.5 Professional certification/membership

Certification involves the provision of a written assurance (a certificate) by an independent body that a product, service or system in question meets specific requirements. Certification can be a useful tool to add credibility, by demonstrating that a product or service meets the expectations of customers or certain requirements.[70] In forensic science, certification provides the means of assurance that individual forensic scientists or practitioners have got the relevant qualification, knowledge, skill, experience, training, or education in their field of expertise. Certification is commonly acquired through a voluntary peer-review process, where experts in a particular forensic science discipline assess a practitioner as having attained the professional qualifications necessary to practice in one or more forensic science disciplines. The certification may involve practitioners having to write examinations established by the certification body, mostly professional association

[67] Ross and Davey (n 58).
[68] The level of standards may stay the same, deteriorate, or improve.
[69] Jones (n 60).
[70] 'ISO - Certification' (*ISO*) <https://www.iso.org/certification.html> accessed 24 June 2020.

bodies, which tests the practitioner's knowledge and expertise in a specific forensic science discipline.[71]

Certification of forensic practitioners is prominent in the USA, where different practitioner associations provide certification for general and specialised forensic science disciplines. These include the American Board of Forensic Toxicology (ABFT) that provide certifications and examinations for forensic toxicologists. The American Board of Criminalistics (ABC) offers certification and re-certification programme in comprehensive criminalistics, as well as in the specialised disciplines of molecular biology, drug chemistry, fire debris analysis, trace evidence—hairs and fibres, paints and polymers.[72] International certification bodies include the International Association for Identification (IAI), which is made up of certification boards who provide certification for different forensic science disciplines.[73] In the UK, there is no formal certification programme for forensic science practitioners. However, the Chartered Society of Forensic Science (CSFS) provides different professional membership status for individuals engaged as forensic examiners, analysts, practitioners or students in forensic sciences.

Generally, professional membership programmes are used to substantiate the professional competency of an individual and could be recognised as a sign of distinction in the individual's area of forensic science. A recent study in the USA found that mandatory certification is strongly supported by forensic science practitioners, because of the belief that it helps establish a threshold for competency in the profession; provides a universal standard for ethical professional conduct, and enhances the credibility of forensic science among forensic service users and the public.[74] However, in the UK, a recent study has surveyed the perceptions of jurors about forensic science expert witnesses and found that jurors regard the expert witness' education and years of experience more important than certification or laboratory accreditation. It was found that jurors perceive the academic qualifications of the expert, the confidence they portray in answering questions, their demeanour and their status of being government employee as a reflection of the expert's credibility.[75] Comparing these findings indicates how certification and an expert's credibility are

[71] Ann Webster Bunch, Thomas Bohan and David Senn, 'Accreditation of Forensic Specialty Certification Bodies' (2017) 8 Forensic Science Policy & Management: An International Journal 22.
[72] 'American Board of Criminalistics (ABC)' <https://www.criminalistics.com/> accessed 24 June 2020.
[73] 'The International Association for Identification - Certifications' <https://www.theiai.org/certifications.php> accessed 26 June 2020.
[74] Haley Melbourn and others, 'Mandatory Certification of Forensic Science Practitioners in the United States: A Supportive Perspective' [2019] Forensic Science International: Synergy <http://www.sciencedirect.com/science/article/pii/S2589871X19301408> accessed 8 August 2019.
[75] A McCarthy Wilcox and N NicDaeid, 'Jurors' Perceptions of Forensic Science Expert Witnesses: Experience, Qualifications, Testimony Style and Credibility' (2018) 291 Forensic Science International 100.

perceived differently between the forensic science community and the judicial community and general public

2.6 Proficiency Testing

The purpose of proficiency testing is to assess the performance of laboratories, in terms of how they conduct specific tests, measurements or calibrations. It is also a performance assessment to check the proficiency of practitioners at performing some specific technical tasks in the laboratory.[76] The motive for proficiency testing is that, as laboratories operate in isolation from other laboratories, this potentially presents opportunities for risks, where a laboratory's data may have errors, biases or significant differences compared to similar laboratories, who provide the same services. Proficiency testing is, therefore, intended to provide an opportunity for laboratories to have an external independent appraisal of their performance at casework analysis compared to some reference values (or other performance criteria) or the performance of similar laboratories.[77] Participation in proficiency testing is a requirement under the ISO/IEC 17025 standard. Both laboratories and practitioners are required to partake in it as part of ongoing accreditation and certification.

There are two main types of proficiency testing, namely; the declared/open and blind testing. With the declared/open testing, the practitioners are aware that they are being tested or are aware that the sample presented for analysis is a test sample. Blind testing is the opposite; the practitioners are unaware that they are being tested or that the case samples are not from a real case.[78] There are different views about the usefulness of both open/declared testing and blind testing, but blind proficiency testing is mostly perceived as the ideal way for testing forensic science laboratories/practitioners. This is because, as practitioners conduct the test samples as they would in their 'real' routine casework, the elements of practitioners' bias and anticipation are mitigated or removed.[79]

However, blind proficiency testing is noted to be uncommon in the forensic field not because of lack of understanding of its necessity, but because of the difficulties to successfully implement such tests, including the financial cost and time of providing test conditions as similar to casework

[76] David James and others, 'External Quality Assessment: Best Practice' (2014) 67 Journal of Clinical Pathology; London 651.
[77] 'UKAS: Proficiency Testing Provider Accreditation' <https://www.ukas.com/services/accreditation-services/proficiency-testing-scheme-provider-accreditation/> accessed 26 June 2020.
[78] Itiel E Dror, 'The Error in "Error Rate": Why Error Rates Are So Needed, Yet So Elusive' (2020) 65 Journal of Forensic Sciences 1034.
[79] Michal L Pierce and Laura J Cook, 'Development and Implementation of an Effective Blind Proficiency Testing Program' (2020) 65 Journal of Forensic Sciences 809.

conditions as possible.[80] Aside the major technical differences between blind and open/declared testing, proficiency testing, in general, is thought to benefit laboratories and personnel because the results provide laboratory managers with either a confirmation that the laboratory's performance is satisfactory or that further improvement is required.[81]

2.7 Regulatory bodies

To this end, it can be noted that different programmes can be used to regulate both laboratories and individual practitioners to achieve different purposes, for the sake of forensic science quality assurance. The application of these programmes, in terms of how they are enforced, is also specific to a country or jurisdiction. A variety of stakeholders in different countries that have scrutinised the quality of forensic science have also captured the challenges with the implementation of some or all of these quality assurance programmes. In 2009, the US National Academy of Sciences' (NAS) report, titled '*Strengthening Forensic Science in the United States: A Path Forward*'[82] captured in-depth problems across different aspects of forensic science in the US. Even though the report's assessment of problems and the recommended solutions were specific to forensic science in the US, the report has been highly referenced in the literature internationally, because of shared commonality in the problems, such as those concerning forensic science quality assurance.

In terms of quality assurance programmes, the NAS report found that these were inconsistently applied across the forensic science sector. The report lauded the efforts of numerous professional associations involved in developing standards and accreditation and certification programs. However, the enforcement and implementation of quality standards and accreditation were criticised. It was found that these programmes were inconsistently applied, causing some areas of forensic science to have achieved standardisation and best practices, while most disciplines lacked any consistent structure for the enforcement of quality standards, standard operating procedures, certification and accreditation programs. Due to this gap, an external oversight body was recommended to oversee the implementation of consistent, harmonised and mandatory quality assurance programmes.[83]

[80] Callan Hundl and others, 'Implementation of a Blind Quality Control Program in a Forensic Laboratory' (2020) 65 Journal of Forensic Sciences 815.
[81] Jonathan J Koehler, 'Proficiency Tests to Estimate Error Rates in the Forensic Sciences Other Papers: Paper' (2013) 12 Law, Probability & Risk 89.
[82] National Research Council, *Strengthening Forensic Science in the United States: A Path Forward* (National Academy of Sciences 2009) <https://www.ncjrs.gov/pdffiles1/nij/grants/228091.pdf>.
[83] National Research Council (n 79), pp.193 – 215.

Since the NAS report, it is reported that some changes have occurred in the oversight of forensic science in the US. For instance, the National Commission on Forensic Science (NCFS) (now defunct) was created to advise the US Department of Justice on matters of forensic science policy at the federal level. The development of OSAC was another initiative to strengthen forensic science in the US.[84] At the State level, forensic science regulatory bodies, in the form of forensic science commissions and oversight boards have been established with the responsibility to enforce mandatory accreditation of laboratories, certification of forensic science practitioners, to investigate cases of quality failures in laboratories and to issue sanctions and corrective actions.[85] The NAS report is also reported to have set the terms for reforms in the regulation and provision of forensic science across States where existing efforts to impose standards and best practices in forensic science practice were absent or implemented through voluntary participation of some laboratories and practitioners.

In Europe, around the same time as the NAS report, measures were developed to improve cross-border crime prevention. The EU Council adopted and implemented different Acts under the EU Treaty to allow for the mutual recognition of the collection, processing, use and delivery of forensic data between authorities responsible for the prevention and investigation of criminal offences in the EU Member States. For instance, the EU Council Framework Decision 2008/615/JHA allows for the exchange of DNA profiles and dactyloscopic data between the Member States.[86] This Decision is aimed at stepping up of cross-border cooperation in combating terrorism and cross-border crime.

As part of these mutual recognition Directives, individual Member States are required to ensure that respective forensic science providers are accredited to the relevant international quality standards. The EU Council Framework Decision 2009/905/JHA sets the requirements for the accreditation of forensic science laboratories who provide DNA and dactyloscopic analyses.[87] The ENFSI has been entrusted with the task of ensuring the implementation of this framework.[88] These directives show the increasing recognition of equivalent minimum forensic science quality

[84] John M Butler, 'Recent Activities in the United States Involving the National Commission on Forensic Science and the Organization of Scientific Area Committees for Forensic Science' (2017) 49 Australian Journal of Forensic Sciences 526.
[85] Sandra Guerra Thompson and Nicole Bremner Casarez, 'Building the Infrastructure for Justice through Science: The Texas Model' (2016) 119 West Virginia Law Review 711.
[86] 'EU COUNCIL DECISION 2008/615/JHA' 1, 615.
[87] 'Council Framework Decision 2009/905/JHA of 30 November 2009 on Accreditation of Forensic Service Providers Carrying out Laboratory Activities' 14, 905.
[88] Aleksandar B Ivanovic, 'Accreditation and Standardization in Forensic Science - Present and Future Reliability of Forensics Examination and Expertise Varia' (2019) 2019 Journal of Eastern-European Criminal Law 200.

standards across EU Member States and the need for forensic service providers to work according to common quality standards to foster closer cooperation between FSPs and criminal justice systems.[89] In the UK, concerns about the quality of forensic science have also led to the creation of the FSR role.[90] The aim of this study was to understand the extent to which this role is fit to improve the quality of forensic service provision, from the crime scene to court.

2.8 The Forensic Science Regulator: rationale, purpose and structure

Over the last two decades, the landscape of forensic science provision in England and Wales has undergone significant structural change. These have impacted upon the governance structure, which has had to evolve in response to issues arising from this changing landscape and ongoing concerns about the quality of forensic science services. As shown in Figure 2.2 below, the complex structure for forensic science governance and oversight consists of several agencies, which report to Home Office Ministers. It is noted that the scope of responsibility for each body needs to be clarified in terms of their specific oversight responsibilities, but at first glance, the role of the FSR may assume an interesting position given the perception of greater influence/and or responsibility given to the title of 'Regulator'. This singular title and the positioning of the FSR role in this governance framework forms part of the rationale of this study; to assess whether the role as presently constituted, can achieve the purpose for which it was created.

This section, therefore, details the rationale for the creation of the FSR role and the institutional structure underpinning the operation of the Regulator. Even though the remit of the FSR excludes regulating the forensic science marketplace through economic measures, exploring the context where FSPs operate—the subjects of the regulation, and how the FSR remit is defined, and the parameters of the role, is important. This may also ascertain any evidence of consideration that was given of the potential implications of commercialisation on the quality of service provision. The impact of commercialisation will also delineate some limitations of the FSR role in improving quality in the context of the marketplace structure. As such, a preliminary account of the evolution of forensic service provision in England and Wales before the creation of the FSR role is necessary.

[89] Zsolt Pádár, Mónika Nogel and Gábor Kovács, 'Accreditation of Forensic Laboratories as a Part of the "European Forensic Science 2020" Concept in Countries of the Visegrad Group' (2015) 5 Forensic Science International: Genetics Supplement Series e412.

[90] It must be noted that no EU Member State has a role that is similar to the role of the FSR.

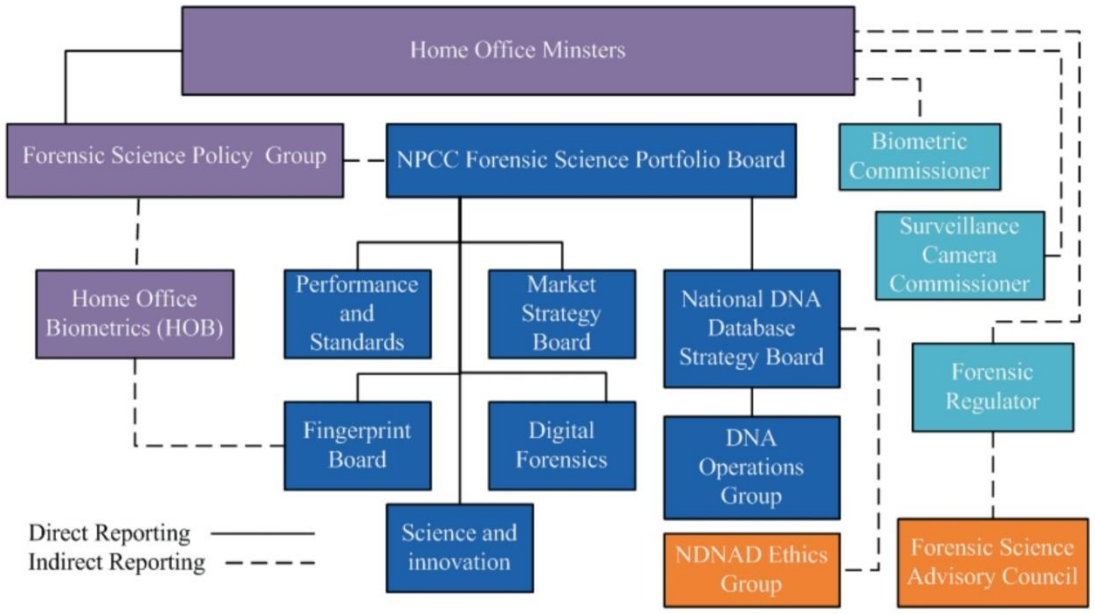

Figure 2.2. The governance and oversight structure of forensics science in England and Wales. Source: The Home Office Forensic Science strategy; p.17.

2.8.1 The framework of forensic service provision

There are debates concerning the ideal model for forensic science service provision. However, most informed parties favour of a model of service provision, which lies outside the control of the police, either by public sector organisations, or private service supply or a mixture of both.[91] This is in light of the need for forensic scientists and their work, to be transparent and impartial, lying outside of potential interference or influence by investigating and prosecutorial agents. Until the early 1990s, the majority of forensic science services, excluding fingerprint analysis and comparison and crime scene examination (CSE), were provided outside policing by the State-owned Forensic Science Service (FSS). The FSS through their seven laboratories across the UK provided a scope of forensic science services to forty-one police forces outside London. The services included scientific analysis and interpretation of almost all evidence types; analysis of DNA and maintenance of the National DNA Database (post-1995); expert testimony in support of prosecutions and research in forensic science. The FSS was funded by police forces through capitation (i.e. the number of police officers or establishment).

Other agencies and individual police forces also provided some forensic services. The Metropolitan Police Forensic Science Laboratory (MPFSL) provided forensic services to the Metropolitan Police

[91] Keith Bedford, 'Forensic Science Service Provider Models – Is There a 'best' Option?' (2011) 43 Australian Journal of Forensic Sciences 147.

Service and the City of London Police. Two further public sector agencies, namely, the Laboratory of the Government Chemist (LGC) provided mainly illicit drugs and document analyses for the HM Customs and Excise, and also provided some work for the MPFSL on a contract basis to assist in reducing case backlogs for the latter. The Defence Research Agency of the Ministry of Defence provided the national capability for the forensic investigation of the illegal use of explosives. Police forces outside London maintained in-house laboratories for the provision of routine scenes of crime investigations in support of their policing operations. The police in-house laboratories were also responsible for the submission of forensic samples for examinations in FSS laboratories. The majority of these laboratories provided services for prosecution purposes. Defence services were provided by public sector laboratories provided that the same laboratory was not analysing samples from the same case on behalf of the prosecution.[92]

Beginning in April 1991, two key changes triggered the evolution of the landscape of forensic service provision in England and Wales, over a short period, from a totally 'free' to use, public service, into a completely marketized system. Firstly, the state-owned FSS was converted to an executive agency of the Home Office, combining all the six FSS laboratories into one organisation. This gave the FSS the ability to charge customers for the forensic service they provided, and this introduced the second change; direct charging for forensic science services. These changes were triggered because of the difficulties of the FSS by that time to meet the increasing forensic demands of police forces, including the advent of DNA analysis in the 1980s. This affected the FSS turnaround time with an increase in case backlogs, which adversely impacted on the duration of crime investigations.[93]

The structural reorganisation of the FSS, including its subsequent conversion into a trading fund status, and the direct charging system were, therefore, attempts to ensure that the FSS could maintain some financial independence and that police forces would be free to spend more on forensic science, allowing for forensic capacity to increase.[94] However, this inherently led to the commercialisation of forensic services; police forces could 'purchase' forensic services from both the FSS and private FSPs. As this progressed, private FSPs began to emerge, including the LGC

[92] Royal Commission on Criminal Justice, *Report* (HMSO publications 1993) <https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/271971/2263.pdf>.
[93] Angela Gallop and Jennifer Brown, 'The Market Future for Forensic Science Services in England and Wales' (2014) 8 Policing: A Journal of Policy and Practice 254.
[94] House of Commons Science and Technology Committee, 'Forensic Science on Trial - Seventh Report of Session 2004–05' (2005) <https://publications.parliament.uk/pa/cm200405/cmselect/cmsctech/96/96i.pdf>.

and Forensic Alliance. As a result, some opinions indicate that the commercialisation of forensic science in England and Wales was caused by accident rather than design.[95]

2.8.1.1 The marketisation of forensic service

The introduction of a charging system for forensic service provision coincided with changes in public sector procurement rules in 1999. This compelled all public sector procurement (including police forces) to always attain 'best value' in the services they purchase. This meant the police had to purchase the 'best value' forensic service(s), whether that be from the FSS, private FSPs and/or individual forensic practitioners. It is reported that competition between the FSS and private FSPs did improve forensic service turnaround times while the costs of forensic analysis also reduced.[96] However, in the interest of obtaining quick results for forensic analysis and saving costs, police forces started in-sourcing some forensic services using their own facilities, in addition to sometimes preferring private sector laboratories who offered cheaper prices than the FSS.[97] As a result, commercialisation tended to benefit police forces while the FSS began to lose the market value of forensic science. The decline of the market value of the FSS was also worsened because of the lack of a clear business relationship between them and police forces.[98]

The FSS had been a 'government-owned company' (GOVCO) since 2005, meaning, it was a state-owned but was obliged to run on a for-profit basis. This notion of turning forensic service into a profitable venture and the competition for forensic service supply was regarded as requiring some form of regulation to ensure a balance between cost-effectiveness, timeliness and the quality of forensic service provided by FSPs. In 2005, the *Forensic Science on Trial* report recommended a market regulator to regulate the emerging forensic science market which encompassed a diverse group of FSPs of different sizes and scope of forensic services they provide.[99] However, instead of a market regulator, systems were put in place to standardise the price of forensic services provided by FSPs.

In 2007, the National Forensic Framework Agreement (NFFA) was introduced to manage outsourced forensic service commissioning and tendering processes for some police forces, all of which have different operational and forensic needs (and budgets). This framework was managed by the National Policing Improvement Agency (NPIA) and supported by the Home Office. The

[95] Mark Walport, 'Annual Report of the Government Chief Scientific Adviser 2015: Forensic Science and Beyond: Authenticity, Provenance and Assurance. Evidence and Case Studies.' (2015).
[96] Gallop and Brown (n 93).
[97] Royal Commission on Criminal Justice (n 92).
[98] House of Commons Science and Technology Committee, 'HC 96-I' (n 94).
[99] House of Commons Science and Technology Committee, 'HC 96-I' (n 94).

purpose of the NFFA was to help police forces achieve value for money by controlling different pricing structures offered for the same forensic analysis by private providers.[100] However, participation in the framework by police forces and FSPs was voluntary. Under the NFFA, forensic science services were categorised into fourteen product packages or lots, which the FSS and private providers bid to supply. The product packages comprised specific routine forensic science analyses, such as DNA, and more complex casework packages relating to serious crime. Each of these had its negotiated price and a cost-code system. The individual FSPs who entered into a contractual arrangement with the police forces and the product packages/lots are captured by Lawless.[101]

It is reported that the FSS was experiencing severe financial difficulties and even though the GOV-CO status was intended to be temporary, ahead of full privatisation, this never happened because the Government had failed to find a private buyer. Some (controversial) costs were reported as totalling £2 million per month which, perhaps, inevitably led to the decision by Government to close the FSS. The government, thus, ceased funding to the FSS in 2010, with its final closure in 2012.[102] Following this, the majority of police forces expanded their in-house forensic science capabilities to incorporate some of the services previously provided by the FSS. For specialised services, which are outside the capacity of police forces, these have to be purchased from private service providers. Since then, a highly competitive and price-sensitive forensic marketplace has developed.

A new forensic service procurement strategy, known as the National Forensic Framework – Next Generation (NFFNG) was introduced, with the same basis of categorisation of forensic science into priced-product packages/lots. However, unlike the NFFA where services were contracted by individual forces, forensic services under the NFFNG were procured based on regional police forces collaborations.[103] Thus, police forces who sought to procure forensic services via the NFFNG offered a local service contract to a successful FSP. Nine FSPs were placed on the NFFNG[104] and for each package, the preferred FSP was selected after short regional mini

[100] Home Office, *Forensic Science Strategy: A National Approach to Forensic Science Delivery in the Criminal Justice System* (Crown copyright 2016 2016) <https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/506683/54493_Cm_9217_Forensic_Science_Strategy_Print_ready.pdf>, p.16.
[101] Christopher Lawless, *Forensic Science: A Sociological Introduction* (Routledge 2016), pp.69-71.
[102] House of Commons Science and Technology Committee, 'HC 96-I' (n 94).
[103] House of Commons Science and Technology Committee, 'Forensic Science - Second Report of Session 2013–14' (2013) <https://publications.parliament.uk/pa/cm201314/cmselect/cmsctech/610/610.pdf>.
[104] Home Office (n 100).

competitions.[105] More than one FSPs was able to supply for each specific product package/lot. This framework has ceased running since July 2016.

Since July 2016, outsourced services are procured differently, based on a fixed price purchase, either in the form of a managed service procurement (complex casework packages) or a commoditised approach (specific forensic analysis). The managed service, which has gained popularity since 2016, comprises a long-term contractual agreement between individual police forces or police regional collaboration and large-scale commercial providers for 'total service' supply. The conditions of service procurement consist of timescales for delivery and the specific quality standards to be met through accreditation. As a result, all private service providers are required to be accredited to ISO 17025 for each of the tendered services, except for defence services and for digital forensics which may be purchased via an ad-hoc process by individual police forces.[106] There also exists a penalty system for late service delivery by commercial providers. Overall, the marketplace is considered as extremely fragile, with risks to the quality of services provided.[107] The implications of the marketplace on the quality of forensic science is captured later on in Chapter 3.

The 2019 House of Lords inquiry into forensic science provision reported that police in-house forensic provision accounts for 80% of all forensic science being 'delivered' in England and Wales, while outsourced services account for 20% of forensic services to law enforcement agencies.[108] Police in-house activities include crime scene examination (CSE), fingerprint enhancement and comparison, explosives and firearms and some aspects of digital forensics. Also, public sector laboratories which are part of the Ministry of Defence undertake specialist services such as explosives examination and chemical, biological, radiological and nuclear examinations. The Metropolitan Police Service (MPS), conduct a much wider range of forensic science activities. The private sector provides much of the analytical laboratory work and expert interpretation, including DNA analysis and toxicology.[109]

2.8.2 The framework for quality assurance of forensic services

Before, and throughout the developing phase of marketisation of forensic service provision, issues about the quality of forensic science had primarily been triggered by concerns about the reliability

[105] House of Commons Science and Technology Committee, 'HC 610' (n 103).
[106] Home Office (n 100), p.15.
[107] Walport (n 95), p.29.
[108] House of Lords Science and Technology Select Committee (n 6), p.15.
[109] Gillian Tully, 'Forensic Science in England & Wales, a Commentary' [2018] Forensic Science International <http://www.sciencedirect.com/science/article/pii/S0379073818303505> accessed 30 July 2018.

of forensic science and expert evidence in court. These include cases of wrongful convictions overturned in the early 1990s, which featured discredited expert evidence. These cases included the infamous "Birmingham Six", who were freed in 1991 after 16 years wrongful imprisonment, and other 'Irish' terrorist miscarriages of justice. Alongside these miscarriages of justice cases in the UK, the US Innocence Project, which was founded in 1992 had analysed their post-conviction exoneration data and identified a number of forensic science related contributors. These cases resulted in criticisms of individual forensic practitioners.

At this time, quality assurance framework for forensic service provision in England and Wales were managed through an ad hoc mix of accreditation against ISO/IEC 17025 for the FSS and private laboratories, and certification for police fingerprint methods against the ISO 9001 quality management standard. This framework was not coordinated to any national overarching strategy and was managed by the individual FSP's accreditation by the UK Accreditation Service (UKAS).[110] The problem with accreditation framework was then the lack of uniformity in the standards for forensic analysis. Individual laboratories defined their own standards for analysis, such as for accuracy and precision of analytical measurement because there were no specified required standards by UKAS. Also, UKAS accreditation did not address forensic activities outside the laboratory setting, such as for the collection of exhibits from crime scenes, again, precluding uniformity in this area.[111]

The criticisms about quality failings caused by forensic practitioners prompted some critical reviews which all spoke of the need for quality assurance for forensic science. A prevailing recommendation was the need to establish an oversight body specifically for forensic science activities in the UK: to establish quality standards, a code of practice and conduct, as well as dedicated audit and accreditation systems.[112] A Royal Commission on Criminal Justice report in 1993 (resulting in the 'Runciman Report'[113]), contained many recommendations specifically focused upon forensic science. Specifically, the 'Runciman Report' recommended the creation of a Forensic Science Advisory Council (FSAC) with a broad remit, including; to oversee the development of formal accreditation for all laboratories, training, accreditation and code of practice for forensic scientists; provide a continuing review of the performance, standards and efficiency of forensic science provision. The report foresaw that the introduction of service charging and

[110] House of Commons Science and Technology Committee, *The Forensic Science Service - Seventh Report of Session 2010-12* (The Stationery Office Limited, London 2011) <https://publications.parliament.uk/pa/cm201012/cmselect/cmsctech/855/855.pdf> accessed 11 October 2017.
[111] Terry Antony Gough, 'Quality Assurance in Forensic Science: The UK Situation' (1997) 2 Accreditation and Quality Assurance 216.
[112] Gough (n 111).
[113] Royal Commission on Criminal Justice (n 92).

competition for forensic service provision appears to be a good way of ensuring that the charges made by the public sector laboratories are reasonable and that the services they offered will meet the customers' needs. As a result, it proposed that the FSAC should ensure that undue competitiveness in the forensic science service purchasing does not lead to a diminution in standards.[114]

A House of Lords' Select Committee on Science and Technology in 1993 also recommended the development of expertise-based qualifications and the registration of forensic scientists. In 1996, the Professor Brian Caddy report[115] which reviewed the contamination case in the Forensic Explosive Laboratory at Fort Halstead recommended the establishment of an Inspectorate of Forensic Science for the registration of forensic science organisations and individual forensic scientists.[116] Triggered by this recommendation, the government considered the creation of a professional register for expert witnesses. This approach was chosen over the recommendations by the 'Runciman Report' for the creation of a Forensic Science Advisory Council (FSAC). This is because the government noted that many of the recommended functions of the FSAC could not be fulfilled effectively without some form of statutory regulation.[117] According to both Black[118] and Kershaw,[119] a Forensic Working Group in 1997 finalised the recommendations for a 'register' of forensic practitioners as a means of quality assurance for expert evidence. Thus, the Council for the Registration of Forensic Practitioners (CRFP), was created in 1999.

2.8.2.1 The Council for Registration of Forensic Science Practitioners (CRFP)

The CRFP was established as an independent professional regulatory body for forensic practitioners. The purpose of CRFP was to create, maintain and promote public confidence in the use of forensic science. This purpose was to be achieved through promoting high standards of forensic practice; publishing a register of competent practitioners; and dealing with registered practitioners who fall short of the required professional standards.[120] The publishing of a multi-disciplinary single register for practitioners was central to achieving the CRFP's aim. However, CRFP membership registration was a voluntary requirement. The individual forensic practitioners

[114] Royal Commission on Criminal Justice (n 92), p.148.
[115] Brian Caddy, 'Assessment and Implications of Centrifuge Contamination in the Trace Explosive Section of the Forensic Explosive Laboratory at Fort Halstead' (1996) <https://parlipapers.proquest.com/parlipapers/result/pqpdocumentview:pdfevent?pgId=db71b55a-95ea-4c96-b9a3-c34afe34c37e&pdf=/app-bin/parliamentary-paper/3/0/3/4/1996-097340_01-43.pdf>.
[116] Caddy (n 115).
[117] Gough (n 111).
[118] SM Black, 'Forensic Anthropology – Regulation in the United Kingdom' (2003) 43 Science & Justice 187.
[119] ARC Kershaw, 'Registration of Forensic Medical Practitioners The Expression of a Standard' (2000) 7 Journal of Clinical Forensic Medicine 179.
[120] Allan Jamieson and Alan Kershaw, 'Standards in Forensic Practice' (2000) 40 Science & Justice 55.

were accredited based on their qualifications and experience, references from colleagues and users of their services, and declarations about their past and future conduct. An assessor from the relevant specialty reviewed a sample of practitioners' recent cases against the Council's competence criteria.

CRFP membership was reported to carry high credibility and included a periodic revalidation of members to maintain competence and provide disciplinary measures to address members' non-adherence to necessary standards.[121] Yet, there were inadequacies, which meant that the CRFP alone did not constitute an effective regulatory structure. The deficiencies of the CRFP were attributed to the many weaknesses in the model created. The primary limitation was the inability of the Council to achieve satisfactory membership due to its voluntary nature and the lack of motivation to drive the registration. As the CRFP was intended to be eventually self-funding by registrations, this caused financial, as well as reputational, difficulties. The Council, thus, could not generate sufficient income from membership registration to fund its operations, and practitioners were not easily persuaded to pay to register (and undertake the significant extra work involved) if not perceiving any benefits from registration when it was voluntary and far from comprehensive.[122]

The CRFP had focused on 'regulating' individual forensic science practitioners but not the organisations and the delivery of forensic science, because it thought that once the standards and values of individual forensic practitioners are set (and stay) high and actively pursued, the way an employer organises and manages the work is a secondary issue.[123] However, in the emerging forensic science marketplace, this practitioner-only accreditation was also insufficient to regulate the growing diversity in forensic science, such as all the emerging (small and large) FSPs and all their latest techniques.[124] The CRFP could not regulate accountability for quality at the forensic organisational level and the future potential disruption by commercialisation already highlighted the need for more comprehensive regulation. This 'lean' regulation by CRFP was similar to the practitioner-focused approach of the Forensic Science Society (now the CSFS) which has, since 1959, been a professional body which aims to provide the opportunity for forensic practitioners and academics for professional development.[125] However, the Forensic Science Society did not foresee its role as expanding to regulation, as it existed for the support and benefit of practitioners,

[121] Kershaw (n 119).
[122] Peter Sommer, 'Certification, Registration and Assessment of Digital Forensic Experts: The UK Experience' (2011) 8 Standards, professionalization and quality in digital forensics 98.
[123] Jamieson and Kershaw (n 120).
[124] Forensic Science Regulator, 'A Review of Options for the Accreditation of Forensic Practitioners' (2009) <http://library.college.police.uk/docs/homeoffice/Review-of-Forensic-Practiti1.pdf> accessed 21 November 2017.
[125] https://www.csofs.org/About-us. Accessed: 07/11/19.

with 'regulation' seen as running contrary to this primary aim. In light of such defects, an effective, comprehensive forensic science regulation model was still required.

2.8.2.2 A Forensic Science Regulator?

In 2005, the '*Forensic Science on Trial'* report by the House of Commons Science and Technology Committee recommended the creation of a Forensic Science Advisory Council to "oversee the regulation of the forensic science market and provide independent and impartial advice on forensic science."[126] The Council was proposed to review, or to commission inspections of, forensic science across the whole of the CJS, and to propose improvements where necessary. A further proposition was for the Council to oversee the work of the CSFS and the CRFP. Rawley and Caddy[127] finalised the recommendation for the FSR role during their independent review of the Damilola Taylor case in 2007. With a strong view that the role was long overdue, they made recommendations for the role and management of the FSR, having discussed the proposals that had been drafted by the Government. They recommended that the Regulator should have control and oversight of a large number of activities which are not necessarily regarded as forensic science (at that time); and that the Regulator should be assisted by a board of experts and should be, and be perceived to be, independent of any possible influence. However, the recommendations did not include whether the FSR should have control over the forensic market as had originally been recommended by the House of Commons Science and Technology Committee.

Based on recommendations, the government responded to create a single 'quality assurance regulator' whose role will be to advise the Government and the CJS on quality standards in the provision of forensic science.[128] This regulation model was to infuse the CRFP's practitioner minimum competence standards across the board of forensic science provision rather than act as a singular standalone evaluation. The model was designed to ensure the accreditation of FSPs on a macro level, with an inspection process tackling the micro-level of corporate organisation, forensic science products and services provided, and individual practitioners.[129] However, the FSR was neither to regulate the pricing of forensic services nor any other economic issues concerning

[126] House of Commons Science and Technology Committee, 'HC 96-I' (n 94), p.28.
[127] Alan Rawley and Brian Caddy, 'Damilola Taylor: An Independent Review of Forensic Examination of Evidence by the Forensic Science Service' (2007).
[128] 'Home Secretary Statement for the Establishment of the Forensic Science Regulator' <https://publications.parliament.uk/pa/cm200607/cmhansrd/cm070712/wmstext/70712m0002.htm#07071262000011> accessed 5 February 2018. See column 67WS.
[129] Forensic Science Regulator, 'A Review of Options for the Accreditation of Forensic Practitioners' (n 124).

forensic service provision. Rather, individual police forces were expected to demand higher standards as part of their procurement of any particular forensic services from private providers.[130]

2.9 The purpose and the role of the FSR

As described earlier, forensic science is not only confined to the operations within forensic laboratories. Rather, it encompasses a wide range of activities from the crime scene to court, including police use of scientific support at the crime scene to assist in the detection of crime and to generate evidence for possible prosecutions. The official documents of the FSR emphasise that the FSR role was established with this reality in mind.[131] For the aim of this study, it was necessary to understand the overarching purpose of the FSR and regard this as a given to identify the indicators to benchmark the effectiveness of the FSR role. A review of documentation concerning the FSR role revealed a slight variation in the description of the purpose of the FSR. It was observed that several publications emanating from the FSR's office and other stakeholders do use different terminologies, such as aims, role, priorities, purpose when referring to the purpose of the FSR. Arguably, this tended to create confusion, different perceptions, and expectations for the FSR role, in terms of the intended outcomes expected of the FSR role.

As of March 2008, the purpose of the FSR role was reported as "to support and enhance the important contribution made by suppliers of forensic science services to the effectiveness of the Criminal Justice System (CJS)".[132] This is because the role was seen as supporting the work of FSPs to ensure that the forensic services they provide will meet the needs of the CJS. This view has recently been reiterated, that "to ensure we have effective scrutiny [of scientific evidence] and to ensure that the public retains confidence in the [criminal justice] system, we must make sure we see the regulations and rules as supportive not superfluous".[133] The first business plan of the FSR which was approved by Home Office Ministers and the Regulator's Advisory Council, therefore, set out the requirements (needs) of the CJS concerning the delivery of forensic science service by all FSPs. These requirements are detailed in Table 2.1 below.

[130] House of Commons Science and Technology Committee, 'HC 96-I' (n 94), p.28.
[131] Rennison, 'The Forensic Science Regulator Business Plan 2008/09 - 2010/11' (n 7), pp.9-10.
[132] Rennison, 'The Forensic Science Regulator Business Plan 2008/09 - 2010/11' (n 7), p.1.
[133] See Rt Hon Sir Brian Leveson's (President of the Queen's Bench Division and Head of Criminal Justice) speech at the Forensic Science Regulator's 2018 Annual Conference. Available at https://www.gov.uk/government/speeches/sir-brian-leveson-speech-at-the-forensic-science-regulator-annual-conference.

Table 2.1. The requirements of the CJS from all FSPs.[134]

The CJS requires of all forensic science providers:
1. The delivery of forensic science services, using the appropriate available scientific techniques, according to the highest professional standards;
2. With efficiency, integrity, impartiality and accuracy at every stage throughout the process;
3. At a cost which represents best value for money, within timescales which meet operational needs;
4. Reflecting an understanding of the needs of the specific customer and the requirements of the CJS as a whole, thereby;
5. Maintaining and enhancing public confidence in the quality and reliability of forensic science in the CJS.

The Regulator further emphasised that the role of the FSR as set by the Secretary of State for the Home Department (Table 2.2 below) were in support of these overarching objectives.[135] The vision of the FSR was for forensic science to be delivered to the CJS that consistently meet high-quality standards and integrity expected by the police, prosecutors, courts and the general public.[136] To achieve this vision, the Regulator was to "provide direction and unity of approach to achieving forensic science quality standards across the UK; place quality at the centre of all forensic science activities; and create a quality standards framework around the full range of forensic processes."[137] However, it was strongly emphasised that the FSR role is not expected to singularly achieve these objectives (in both Tables 2.1 and 2.2). Rather, where structures, processes and organisations existed to deliver any of the objectives of the FSR, the expectation was for the FSR to work through support and coordinated activities, where appropriate, to achieve objectives, unless these processes were unable, for some reason, to deliver the required outcome.[138]

[134] Rennison, 'The Forensic Science Regulator Business Plan 2008/09 - 2010/11' (n 7), p.1.
[135] Rennison, 'The Forensic Science Regulator Business Plan 2008/09 - 2010/11' (n 7); Forensic Science Regulator, 'Forensic Science Regulator Business Plan 2013/14' <https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/229450/fsr-business-plan-1314.pdf> accessed 5 February 2018.
[136] Andrew Rennison, *Forensic Science Regulator Annual Report* (2009) <https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/118900/FSR-annual-report.pdf> accessed 26 January 2018; 'Forensic Science Regulator Business Plan 2012 - 2017' <https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/143740/business-plan-2012-2017.pdf> accessed 5 February 2018.
[137] Rennison, *Forensic Science Regulator Annual Report* (n 136).
[138] Forensic Science Regulator, 'Forensic Science Regulator Business Plan 2013/14' (n 135), p.20; Rennison, 'The Forensic Science Regulator Business Plan 2008/09 - 2010/11' (n 7), pp.2-3.

Table 2.2. The role of the FSR.[139]

1. To establish, and monitor compliance with, quality standards in the provision of forensic science services to the police service and the wider CJS;
2. To ensure the accreditation of those supplying forensic science services to the police, including in-house police services and forensic suppliers to the wider CJS;
3. To set and monitor compliance with, quality standards applying to national forensic science intelligence databases, beginning with the National DNA Database (NDNAD) and the National Ballistics Intelligence System (NBIS) and extending to others as they arise;
4. To provide advice to Ministers, CJS organisations, suppliers and others as seems appropriate, on matters related to quality standards in forensic science; and
5. To deal with complaints from stakeholders and members of the public in relation to quality standards in the provision of forensic science services.

However, in recent years, the purpose of the FSR has undergone slight changes. In her first annual report in 2015, the second appointed Regulator reported that "[t]he post of [FSR] was established in order to ensure that the provision of forensic science and forensic pathology across the [CJS] of England and Wales is subject to an appropriate regime of scientific quality standards".[140] Thus, what was initially recorded as the vision of the FSR is presently recorded as the purpose of the FSR. This is available on the FSR website, including a broad range of 'priorities' and 'aims' of the FSR.[141]

Despite this slight variation in the purpose of the FSR, the quality of forensic science services appears common and central to the FSR role. Thus, it can be argued that the FSR role aims to ensure that the programmes developed by the Regulator will help and improve the quality of forensic science services that FSPs deliver to the CJS. This view is supported by the requirement for all FSPs to voluntarily adopt the Regulator's quality standards, achieve and maintain accreditation, and comply with regulatory requirements and guidance, including to report complaints and quality failures to the Regulator.

2.9.1 Indicators of success of the FSR

The first FSR's business plan suggested some criteria for measuring the successes of the FSR role across some of its objectives for the year under review. These objectives included the development

[139] Rennison, 'The Forensic Science Regulator Business Plan 2008/09 - 2010/11' (n 7), pp.1.
[140] Gillian Tully, *Forensic Science Regulator Annual Report 2015* (2015), p.4. <https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/482248/2015_FSR_Annual_Report_v1_0_final.pdf> accessed 26 January 2018.
[141] 'Forensic Science Regulator' (*GOV.UK*) <https://www.gov.uk/government/organisations/forensic-science-regulator/about> accessed 17 August 2020.

of standards for forensic science disciplines; conducting a comprehensive risk assessment for forensic science provision; and identifying the end-user requirements in relation to the quality of forensic science services and the quality of forensic practitioners' contribution to criminal proceedings and inquests. The indicators of success were to include the measurement of the extent to which quality standard documents and other reports of the FSR will secure the overall approval of key Stakeholders; the accessibility and intelligibility of these documents and reports and the extent to which they will make a difference across forensic service provision—that is, "produce proposals for beneficial, realistically achievable, change." [142] The second Regulator over the years has also assessed their successes based on the achievement of some priorities and objectives, like those established by the first Regulator. This suggests that assessing the successes of the FSR role has been a nuanced approach, depending on the priorities and objectives set by the Regulators; and there is no developed single framework available to satisfactorily measure successes in the form of 'changes or improvement' that the FSR role has caused to the provision of forensic science services. This has been the justification for this study: to address the gap in knowledge that may have been left by the unidimensional approach of assessing the effectiveness of the FSR role.

Clarifying the purpose of the FSR and identifying some indicators to measure for quality improvement in forensic service provision caused by regulation was, therefore, central to this study. Quality has been defined by the Regulator as the totality of features and characteristics of a product or service that bear on its ability to satisfy stated or implied needs.[143] This is in line with the ISO's definition which adds that the needs or requirements to benchmark the quality of a product or service can be set by interested parties who can affect, be affected by, or perceive themselves to be affected by the product or service, such as customers, service providers and regulators.[144] This put the requirements of the CJS as set out by the FSR concerning the delivery of forensic science services by all FSPs (Table 2.1) at a critical position, in terms of identifying the features of quality forensic science. The requirements are also influential in terms of identifying and selecting the relevant indicators to determine the impact of the FSR role on the quality of forensic service provision.

This is because when considering the purpose of the FSR role, assessing the effectiveness of the FSR can be complicated because of the multiple objectives in Table 2.1 and Table 2.2. For the individual roles of the FSR in Table 2.2, the fulfilment of these roles will indicate the performance of the Regulator in terms of the measures being put in place or provided as the means to effect

[142] Rennison, 'The Forensic Science Regulator Business Plan 2008/09 - 2010/11' (n 7), p.8-17.
[143] The Forensic Science Regulator, *Codes of Practice and Conduct* (2020).
[144] 'ISO 9000:2015, Quality Management Systems — Fundamentals and Vocabulary' (n 28).

improvement in the quality of forensic science. However, to determine whether quality has been achieved or improved and the respective impact of the FSR role will require further indicators in the context of the work produced by FSPs. This is what makes the individual requirements of the CJS concerning the delivery of forensic science services persuasive, because they are not only some indicators to judge whether the work of FSPs meets the requirements of service users, but they also provide some framework for determining the contribution and the value that the role of the FSR add to the provision of 'quality' forensic science services. This is rightly articulated by the Regulator, that the development and implementation of quality standards is a means to ensuring that all forensic sciences will be conducted by competent forensic scientists, according to scientifically valid methods and transparently reported to service users.[145] However, to explore their relevance as indicators of quality forensic science, the CJS' requirements as set out by the FSR were examined to determine their correlation with the forensic needs of the court at large.

2.9.2 The relationship between the CJS' requirements and the forensic needs of the court

The CJS comprises different actors, such as the police, Crown Prosecution Service (CPS), defence lawyers and the courts, all of whom may have some (or different) needs for forensic science services. This can lead to difficulties in understanding and identifying the individual requirements concerning what counts as quality forensic science service that can satisfy the needs of all forensic service users. However, it was important to examine the relationship between the requirements of the CJS as set out by the FSR and the needs of the court as the ultimate users of forensic science services. This was done through comparison with the Criminal Procedure Rule(s) (CPR), as amended, that apply to the use of forensic science in court. The relationship was found between the CJS' requirements and Part 19 of the CPR—which apply to the assessment of expert evidence[146] and the associated CPD[147] which interprets this Rule; and Parts 1.0 and 3.2 which outline some requirements for forensic science in the broader context of the overriding objectives and duties of the court. This is shown in Table 2.3 below.

[145] Gillian Tully, *Forensic Science Regulator Annual Report 2019* (2020) <https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/877607/20200225_FSR_Annual_Report_2019_Final.pdf> accessed 15 July 2020.
[146] *The Criminal Procedure Rules 2015 - No. 1490 (L. 18) as Amended April 2018 & April 2019* (Crown copyright 2015) <https://www.justice.gov.uk/courts/procedure-rules/criminal/docs/2015/crim-proc-rules-2015-part-19.pdf> accessed 26 January 2018.
[147] *Criminal Practice Directions 2015 Consolidated with Amendment No.8 [2019] EWCA CRIM 495* (2019) <https://www.judiciary.uk/wp-content/uploads/2019/03/crim-pd-amendment-no-8-consolidated-mar2019.pdf> accessed 7 June 2020.

Table 2.3. Relationship between the CJS' requirements for forensic service provision as set out by the FSR role and the CPR/CPD.

Requirement	**CPR/CPD**
1. The delivery of forensic science services, using the appropriate available scientific techniques, according to the highest professional standards. 2. With efficiency, integrity, impartiality and accuracy at every stage throughout the process.	Part 19.3(3)(c) of the CPR (as amended) requires the expert witness to give notice of anything which might reasonably be thought capable of: i) undermining the reliability of the expert's opinion or; ii) detracting from the credibility or impartiality of the expert. CPD Part 19A.5 (a – h) provide the factors to assess these matters, including: i) the validity of the methods by which scientific results are obtained; and ii) whether the expert's methods followed established practice in the field. Part 19A.5 lists the factors which the court may take into account in determining the reliability of expert opinion. These include (i) if the expert's opinion relies on an inference from any findings, whether the opinion properly explains how safe or unsafe the inference is (whether by reference to statistical significance or in other appropriate terms); (ii) if the expert's opinion relies on the results of the use of any method, the opinion should take proper account of matters, such as the degree of precision or margin of uncertainty, affecting the accuracy or reliability of those results. Part 19A.7 lists the matters to assess credibility and impartiality both in relation to the expert and any corporation or other body with which the expert works, including: i. any adverse finding, disciplinary proceedings or other criticism by a professional, regulatory or registration body or authority, including the FSR; ii. lack of accreditation or other commitment to prescribed standards where that might be expected; iii. a history of failure or poor performance in quality or proficiency assessments; iv. a history of lax or inadequate scientific methods; v. a history of failure to observe recognised standards in the expert's area of expertise; vi. a history of failure to adhere to the standards expected of an expert witness in CJS.

3. At a cost which represents best value for money, within timescales which meet operational needs.	CPR Part 1.1 (1): The overriding objective of the CPR is that criminal cases be dealt with justly. This includes dealing with the case efficiently and expeditiously (Part 1.1 (2)(e)). Part 3.2 of the CPR sets out the duty of the court in terms of case management. This includes achieving certainty as to what must be done, by whom, and when, in particular by the early setting of a timetable for the progress of the case; ensuring that evidence, whether disputed or not, is presented in the shortest and clearest way. These Rules put together require that each participant (including forensic science) assists in the conduct of each case, the preparation and conduct of the case in accordance with the overriding objective; and comply with the Rules, CPD and directions made by the court.
4. Reflecting an understanding of the needs of the specific customer and the requirements of the CJS as a whole, thereby;	CPR Part 19.4(j) and (k) require that the content of an expert's report to the court include a statement of declaration of truth, including a statement of the expert's understanding of their duty to the court, and compliance with that duty. Part 19B (13) of the CPD provide examples, including experts' declaration that they have acted in accordance with the FSR Codes of Practice and Conduct.
5. Maintaining and enhancing public confidence in the quality and reliability of forensic science in the CJS.	Again, this is in line with the need for FSPs and experts to act in accordance with the objectives of the court. Especially, achieving reliability requires that the soundness the expert's field of expertise and methodology and the validity of any assumptions relied on.[148]

[148] The Law Commission (n 38), p.17.

In addition to the relationship between the CJS' requirements as set out by the Regulator in 2008 and some relevant sections in the CPR/CPD which apply to forensic science, there is a further link between the role of the FSR and Table 2.3. The relationship is found through the court's acknowledgement of the requirement for FSPs to comply with the quality standard requirements of the FSR role. Thus, the quality standard requirements of the FSR role provide a framework to assist the courts' assessment of the quality and the reliability of forensic science evidence. It is even hoped that the FSR by establishing and, enforcing quality standards for forensic service provision will reduce the risk of forensic science quality failings, wherever these may occur, which may impede or prevent the identification, prosecution and conviction of offenders establishing.[149] This means that assessing the impact of the FSR role on the quality of forensic science from the perspective of how the Regulator's programme of work assists FSPs to meet the CJS' requirement concerning the delivery of forensic science services is a relevant approach.

However, it was recognised that some of the CJS' requirements do not come directly under the remit of the FSR. These include the requirement for forensic services to be delivered according to the best value for money and within timescales which meet operational needs. Rather, these fall under the remit of other structures and processes, such as police forensic service contracts with private FSPs via the forensic marketplace (described earlier) and other agencies which are explained below. This further points to the expectation for support and coordination between the FSR role and the appropriate structures and processes to deliver quality-related objectives for forensic service provision. It also directs the need to assess the impact of these structures and processes on the quality of forensic services.

2.10 Supporting parties/structures of the FSR role

2.10.1 The CPS

One of the key actors which the FSR collaborates with is the CPS. The CPS is in charge of prosecuting criminal cases that have been investigated by the police and other investigative organisations in England and Wales. To ensure fair, objective and independent prosecutorial process, the CPS demand that two criteria are met; namely, the satisfaction that there is sufficient evidence to provide a realistic prospect of conviction, and that prosecuting is in the public interest.[150] Based on this the CPS has set five key requirements for FSPs, including to:

i. comply with the Codes of Conduct and Practice set down by the FSR.

[149] Rennison (n 7), p.19.
[150] 'The Crown Prosecution Service' <https://www.cps.gov.uk/> accessed 18 September 2020.

ii. ensure quality standards and assurance processes are applied which are nationally consistent and compliant with appropriate ISO standards, UKAS accreditation, EU directives and clear development and validation processes.
iii. provide clear communication and interpretation of scientific processes, procedures, strengths, weaknesses and meaning.
iv. engage with Streamlined Forensic Reporting (SFR) process associated with proportionate prosecution requirements.
v. be fully aware of and compliant Disclosure and Expert Witness obligations.[151]

The CPS' requirement for quality standards and the accreditation of FSPs overlap with the Regulator's requirement for accreditation of FSPs. The other three requirements also align with the CJS' requirements for the delivery of timely forensic services that reflects the understanding of the needs of the CJS as a whole, including the disclosure of evidence. These overlaps in the requirements concerning the delivery of forensic services reinforce the view that different aspects of the quality of forensic service provision may be delivered by other agencies or outside the control of FSR, hence, the need for support and coordination between all relevant parties.

2.10.2 Streamlined Forensic Reporting

SFR was introduced in 2013 as a case management procedure with an underlying objective to reduce costs and delay associated with forensic evidence where such evidence adds no value to the administration of justice.[152] Thus, in line with the CPR requirements (Part 1.1 (2)(e)) and Part 3), SFR seeks to ensure that a proportionate forensic science work is carried out in the shortest and clearest way. The SFR can be used to provide evidence of identification of evidential material (SFR stage 1 (SFR1)) or the evaluation/interpretation of evidence (SFR stage 2 (SFR2)). The SFR1, particularly, is intended to provide a summary of forensic evidence to allow the rapid identification and agreement of matters in issue between the parties in a case. It is therefore not a statement or an expert's report that meets relevant the revenant requirements in the CPR (Part 19.4). The impact of SFR on the quality of forensic science is examined in Chapter 3.

[151] The Crown Prosecution Service, 'Forensic Science: Core Foundation Principles for Forensic Science Providers' <https://www.cps.gov.uk/legal-guidance/forensic-science-core-foundation-principles-forensic-science-providers> accessed 15 September 2020.
[152] 'National Streamlined Forensic Reporting Guidance, Section 2 - The Toolkit Version 3.0' <https://www.cps.gov.uk/legal-guidance/streamlined-forensic-reporting-guidance-and-toolkit>.

2.10.3 The Regulator's Advisory and Specialist Groups

Since the creation of the FSR role in 2007, two Regulators have occupied the position.[153] The Regulator is a public servant appointed and sponsored by the Home Office. The responsibilities/role of the Regulator is confined to England and Wales. However, both Scotland and Northern Ireland, through their respective forensic science authorities have agreed to adopt the Regulator's quality standards; and collaborate with the Regulator in the establishment of the quality standards. The respective authorities from both jurisdictions have joined the advisory groups of the Regulator (Figure 2.3) and adopted the quality standards produced, but with some exceptions due to differences in jurisdictional practice. Essentially, these standards apply to all FSPs within the CJS across the UK.[154]

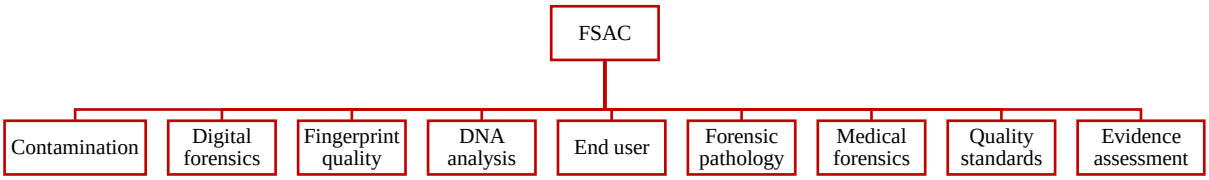

Figure 2.3. The structure of the FSAC and its sub-specialist groups who support the work of the FSR.

Both individuals who have acted in the role of the Regulator, have stressed the importance of engagement with stakeholders including forensic science practitioners and experts. As a result, supporting groups have been established, including the Forensic Science Advisory Council (FSAC) and Specialist Groups, as shown in Figure 2.3 above. The individual terms of reference for each of the Specialist Groups and FSAC are published by the FSR. The role of the FSAC, chaired by the Regulator, is to advise and support the Regulator. The individual specialist groups also undertake studies within their areas of expertise and provide guidance on all processes leading to the establishment of the appropriate quality standards for the respective forensic disciplines within the sector. This is to ensure the establishment of discipline-specific quality standards.[155] As a result, the work of the FSR specialist groups differs from the work of forensic science SWGs who develop

[153] The first Regulator, Mr. Andrew Rennison was appointed on the 11th February 2008 and served until 31st August 2014. The second and current FSR has been in office since 17th November 2014 to date, following her reappointment in 2017 which lasts till 2020.
[154] Rennison, 'The Forensic Science Regulator Business Plan 2008/09 - 2010/11' (n 7).
[155] https://www.gov.uk/government/organisations/forensic-science-regulator/about/membership

guidelines and practice protocols for carrying out specific processes and activities across different forensic science disciplines.

2.10.4 Professional bodies

The Regulator also benefits from the support of a wide range of professional and representative bodies, both within and outside the forensic science sector, to produce industry and discipline-specific quality standards. These include the CSFS, the Association of Forensic Science Providers (AFSP), the UK and Ireland Association of Forensic Toxicologists (UKIAFT), the College of Podiatry, the Royal College of Pathologists, the Institute for Archaeologists, the General Medical Council (GMC), and the Royal Anthropological Institute. Notable support has been provided by the CSFS in assisting small and micro-businesses to achieve the necessary ISO17025 and 17020 standards in a cost-proportionate manner. The pilot scheme to develop a cost-effective route has been ongoing since 2015.

2.11 Chapter conclusion

This Chapter has captured the different ways of regulating the provision of forensic science services to ensure good quality services that remains fit for criminal justice purpose. In England and Wales, some requirements of the CJS concerning the delivery of forensic services by all FSPs have been examined. These requirements have been instructional to the programmes of work of the independent role of the FSR which aims to improve the quality of the services provided by both police forces and private FSPs. As a result, these requirements provide a framework of indicators for determining the impact of the Regulator's programme of work on the quality of forensic service provision. However, there are other agencies and structures which aim to deliver some of the requirements of the CJS concerning quality forensic science. These include the 'hybrid' system of forensic service provision by both police forces and private FSPs—the latter through police procurement frameworks. This makes a strong case that the impact of these agencies and structures on the provision of forensic services by FSPs must be considered in the assessment of the impact of the FSR role on the quality of forensic service provision. This, arguably, complicates any attempt to assess the impact of the FSR role on the quality of forensic science. The next chapter begins the process of assessing the effectiveness of the FSR role.

Chapter 3. The FSR role and the quality of forensic science: document analysis

The first research objective was to determine the structural and contextual factors which impact upon the FSR role and affect the operations of the Regulator. Part of this objective was achieved through document analysis of stakeholder reports. Document analysis is a qualitative research technique in which documents are treated as data sources and reviewed to elicit meaning, gain understanding, and develop empirical knowledge about a phenomenon under study.[156] The examples of documents that can be a source of rich data include non-technical literature, such as annual reports, newspapers, newsletters of institutions and other public records. Overall, the document analysis achieved two purposes for this study. Firstly, it provided a preliminary data for the first research question, including the extent to which the two appointed Regulators have tended to fulfil the role of the FSR, the challenges they have faced which risk the achievement of quality forensic science, and some quality-related consequences of the commercialisation of forensic service provision. Secondly, it established the direction of the study, in terms identifying the gap in knowledge about the effectiveness of the FSR role, the necessary questions to be posed, and the data required to address this gap.

3.1 Document analysis methodology

Thirteen stakeholder reports were analysed for recurrent themes about the role of the FSR. These reports included six annual reports of the FSR (2008/09 – 2019/20); five reports by the House of Commons Science and Technology Committee; one report by the House of Lords Science and Technology Committee; and one report by the Home Office. These documents were chosen for analysis because they contained in-depth information about the forensic science sector and the role of the FSR. Secondly, the documents had been published from first-hand information and experience of forensic science practitioners and stakeholders across the UK. They were, therefore, original sources of information. Other documents, such as the Regulator's Codes of Practice and Conduct and the FSR newsletters were used to provide other supplementary information. It must be acknowledged that the analysis was limited to documents that were readily available through searching the website of the Stakeholders listed above. Hence, the analysis misses other potentially relevant documents that may have been archived in print or other government websites and, therefore, were difficult to find or unavailable through the internet searching.

[156] Glenn Bowen, 'Document Analysis as a Qualitative Research Method' (2009) 9 Qualitative Research Journal 27.

The reports were analysed using the NViVo software for qualitative data analysis. The iterative process involved a thematic analysis procedure, involving extensive reading and interpretation of information in the reports to identify recurrent information, known as codes. These codes were used to construct themes about the achievements, challenges, risks to the quality of forensic science and emerging issues about the role of the FSR. These themes emerged from the document analysis, with the exception of "risks to the quality of forensic science" which was captured in the FSR Annual Reports. The themes were compared with the original reports for similarities and differences. The results are detailed in section 3.2. The interpretations of the results in terms of how they relate to the aim of this study are detailed in sections 3.3 and 3.4, in the form of discussion and conclusion, respectively.

3.2 Results of document analysis

3.2.1 Achievements of the FSR

3.2.1.1 An increasing framework of quality standards

The FSR has established the Regulator's 'Codes of Practice and Conduct for Forensic Science Providers and Practitioners', herein referred to as the Codes. The Codes were originally produced in December 2011 and cover three aspects of regulation:

1. the Code of conduct, which details the values and ideals for individual forensic practitioners;
2. the Code of practice for forensic science providers, developed from the international standards ISO 17025:2005, as interpreted by ILAC G19:08/2014 in the context for forensic science processes; and
3. the Statement of Accreditation requirements, which specify the requirements and deadlines for achieving accreditation to the required standards.

Since its development, it is expected by the Regulator that all quality standards for the provision of forensic science across the CJS should be achieved through the FSR Codes. Together, the Codes interpret the requirements for FSPs at the organisational, technical and practitioner levels to demonstrate one's ability to provide products and services that consistently meet the requirements of the wider CJS.[157] According to the needs of the CJS identified in the previous chapter, the Codes

[157] Forensic Science Regulator, *The Codes of Practice and Conduct-Issue 4* (The Forensic Science Regulator 2017) <https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/651966/100_-_2017_10_09_-_The_Codes_of_Practice_and_Conduct_-_Issue_4_final_web_web_pdf__2_.pdf> accessed 19 February 2018.

cover many important aspects of forensic service provision, including requirements for FSPs to demonstrate the assurance of the quality of test results; independence, impartiality and integrity; internal audit; staff competence; test methods and method validation, for example. The Codes also include requirements for FSPs to review requests, tenders and contracts; implement policies and procedures for avoiding, monitoring and detecting contamination; assuring the quality of test results; accurate reporting of results; and for reporting complaints and all non-conforming practices to the Regulator.[158]

Also, the Codes are updated when appropriate to match developments in both the forensic science sector and the CJS. The amendments of the Codes are also triggered by the assessment of risks across forensic service provision. Some of these changes have resulted in updates of the Codes (Issue 5 published in 2020), to reflect the relevant amendments in the CPR and CPD.[159] The FSR through collaboration with the Association of Forensic Science Providers (AFSP)[160] has developed the Legal Obligation Guidance document for FSPs. This document details the obligations of experts reporting for all FSPs from the relevant sections of the CPR.

The Codes are also enhanced with appendices and guidance documents as standalone directives tailored to some specific areas of forensic science. The number of quality standards and the guidance documents published each year to enhance the Codes is reported in the FSR annual reports. Newer standards are being developed for emerging forensic science techniques such as forensic anthropology and podiatry. Some standards are also being updated to reflect developments in their respective disciplines. The ISO 17020 standard has been adopted as the standard for inspection services, such as crime scene examinations. There has been an ongoing pilot study since 2015 to test the applicability of this standard for suppliers who provide case reviews for defence solicitors.[161]

One notable persistent high-risk area has been the lack of a standard for evaluative interpretation of forensic evidence. According to the Regulator, exemplary court cases of challenged evidence have been reported, such as when a lack of sufficient statistical significance and the

[158] Forensic Science Regulator, *The Codes of Practice and Conduct-Issue 4* (n 157).
[159] Gillian Tully, *Forensic Science Regulator Annual Report 2016.* (2017) <https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/581653/FSR_Annual_Report_v1.0.pdf> accessed 10 October 2017.
[160] The AFSP is an independent, representative body of forensic science providers in the UK and the Republic of Ireland that seeks by its activities to facilitate the effective delivery of justice and promote public confidence in forensic science. See more at: http://www.afsp.org.uk/.
[161] Tully, *Forensic Science Regulator Annual Report 2016.* (n 159).

representativeness of datasets that support the scientific evidence.[162] Delays with producing this standard and others have been caused by lack of research funding, some inconsistency in available data and insufficient finance. As of February 2020, a second draft of the evidence evaluative standard has been developed and awaiting a wider review to finalise the standard.[163]

3.2.1.2 Increasing number of accredited FSPs

The Regulator puts the responsibility on FSPs to get accredited to the FSR Codes. FSPs are broadly defined by the Regulator as comprising individual practitioners, academics, public or private sector forensic science providers, small teams in larger organisations, sole practitioners or large providers, working for the police, or instructed by the prosecution or defence.[164] However, the requirement for accreditation is voluntary. This is because the FSR role was established with a 'light touch' approach instead of having a statutory basis which could put restraints on the Regulator in the discharge of regulatory duties.[165] Without any statutory powers to enforce accreditation, the Regulator has been reliant upon voluntary accreditation deadlines to try and ensure that FSPs comply. Accreditation to the FSR Codes is, therefore, not mandatory but it is to be treated as non-optional.[166] Besides these 'nominal' accreditation deadlines, the Regulator relies upon a range of indirect measures to encourage and secure the adoption of the relevant standards, in both format and against scheduled timelines. These include the forensic procurement arrangements between police forces and private FSPs, and engagement and support from the Regulators, including funded pilot studies, workshops and conferences.

The accreditation process is managed by UKAS and involves an on-site inspection by technically competent assessors across a range of forensic disciplines. The inspection process includes the assessment and evaluation of the service provider's compliance against the Codes, the assessment of training and on-going competence of practitioners within the organisation, validation of methods and tests and evidence of impartiality in the organisation's activities. This is managed on a 4-year

[162] Gillian Tully, *Forensic Science Regulator Annual Report 2017* (2018) <https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/674761/FSRAnnual_Report_2017_v1_01.pdf> accessed 26 January 2018.
[163] Tully, *Forensic Science Regulator Annual Report 2019* (n 145).
[164] Forensic Science Regulator, *The Codes of Practice and Conduct-Issue 4* (n 157), p.13.
[165] House of Commons Science and Technology Committee, *HC 855* (n 110).
[166] Forensic Science Regulator, *The Codes of Practice and Conduct - Issue 3.* (The Forensic Science Regulator 2016) 3 <https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/499850/2016_2_11_-_The_Codes_of_Practice_and_Conduct_-_Issue_3.pdf> accessed 19 February 2018. See page 2.

cycle with at least an annual on-site visit by UKAS. All technical issues resulting from the independent accreditation assessment are reported to the FSR.[167]

For the majority of forensic science disciplines, including digital forensics, formal accreditation to the relevant quality standards was required by October 2017 while that for fingerprint comparison and crime scene examinations were set for October 2018 and 2020, respectively. By the October 2017 deadline, it was reported that 19 organisations were accredited to the Codes; 14 were in the process of extending their accreditation to incorporate the Codes; whilst seven withdrew from the process during the assessment due to insufficient preparation. According to the Regulator, the extent of compliance with the Codes has "increased significantly" over the years, becoming a major step forward towards achieving the purpose of the FSR. As of February 2020, it is reported that 42 organisations (comprising both public and private) have been accredited to the Codes.[168]

3.2.1.3 Investigation of quality-related failings

In line with the investigative responsibility of the FSR, section 14 of the Codes (Issue five) require all FSPs to inform the Regulator of any quality-related complaints or non-conforming testing/inspection if it has significantly disaffected the customer such that it could attract adverse public comment, be against the public interest or lead to a miscarriage of justice. The referral of cases to the FSR is to allow investigations into quality-related failures. In July 2019, the Regulator launched an Anonymous Reporting Line to allow the general public and forensic science professionals to report concerns about forensic science quality. Section 15 of the Codes (Issue five) provide a list of examples of non-conformities that should be escalated to the Regulator. The number of referral cases to the Regulator between 2008 and 2018/19 is shown in Table 3.1. Depending on the severity of a case and its potential impact on the CJS, the investigations are conducted solely by the Regulator, or in conjunction with the UKAS and the police, such as cases with potential criminal liability.

[167] Andrew Rennison, 'Report into the Circumstances of a Complaint Received from the Greater Manchester Police on 7 March 2012 Regarding DNA Evidence Provided by LGC Forensics.' (2012) <https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/118941/dna-contam-report.pdf> accessed 5 April 2018.
[168] Tully, *Forensic Science Regulator Annual Report 2019* (n 145).

Table 3.1. The number and classification of quality referral cases to the Regulator.

Case classification	**2008-13[169]**	**2014/15**	**2015/16**	**2016/17**	**2017/18**	**2018/19**
High	-	7	9	14	6	4
Medium	-	15	33	25	44	60
Low	-	9	13	14	27	29
Outside the scope of the FSR	-	3	4	6	8	11
Total	60	34	55	59	85	105

The table above indicates that not only has there been an increase in the number of referral cases within the Regulators' remit but also an increase in the complexity of cases. Some of these cases have resulted in 'near misses' of miscarriages of justice.[170] Some of the high-profile cases that have been investigated by the Regulator in conjunction with the police include the case of Mr Adam Scott in 2011 whose wrongful charging for rape was later found to be the result of a contaminated DNA test caused by negligence in the process of DNA extraction process by the LGC lab. The Regulator concluded in his investigation report that Mr Adam Scott was an "innocent victim of avoidable contamination from an unrelated case that did contain his DNA." Even though the laboratory was accredited for their validated DNA extraction method and processes, it was found that contamination was caused by human error by a technician who failed to follow basic procedures for the disposal of plastic trays used as part of a validated DNA extraction process. The procedures themselves were also found to be "not adequate leading to no records maintained by the technicians…"[171]

In 2017, a case of quality failure involving alleged practitioner malpractice at Randox Forensic Testing (RTS) Ltd. was reported to the Regulator. This turned out to be the largest quality failing in the history of forensic science in England and Wales, having affected more than 10,000 cases, including rape and murder cases between 2013 and 2017 across 42 police forces. According to the Regulator, even though RTS was accredited to the appropriate quality standard, the alleged malpractice was not discovered by the laboratory's usual quality checks.[172] In the same year, the

[169] *Between 2008 and 2013, cases were recorded by the first Regulator without any classification.
[170] Tully, *Forensic Science Regulator Annual Report 2017* (n 162).
[171] Rennison, 'FSR-R-618' (n 167), p.13.
[172] Tully, *Forensic Science Regulator Annual Report 2017* (n 162).

Metropolitan Police laboratory reported an incident of practitioner malpractice which had affected 33 serious and volume crime cases between 2012 and 2017.

Of the cases that have been investigated by the FSR, post-investigative responses have remained similar over the years, including engaging with the organisations involved to identify causes of failures and steps to address them, commissioning independent reviews of the evidence and updating standards or publishing new standards and guidance documents.[173] The FSR does not have powers to sanction FSPs for quality failures. However, the Regulator publishes findings and recommendations (called 'Lessons Learnt') from investigating cases of quality failures on its website. This is intended to disseminate information which might provide guidance or clarity to other organisations and practitioners in the forensic community. Some publicised areas include errors related to competency and integrity; the handling of proficiency test samples; and contextual bias. According to the Regulator, the increasing number of quality failures is not itself problematic, because it shows that failures are being identified and acted upon and not necessarily that number of failures is increasing. This is claimed also to be in line with the increasing number of quality standards being introduced into successive forensic disciplines. As a result, of greater concern to the Regulator are quality failures that are unrecognised or unreported and so are not effectively dealt with.[174]

However, the quantitative data do not provide enough evidence about the dynamics of reporting or under-reporting of cases. For instance, there is no explanation why the numbers of both low-risk and medium-risk cases being reported to the FSR have been increasing, but the number of high-risk cases has been decreasing since 2017. A decrease in the number of quality failures could mean anything, from low or (non)reporting of cases to increasing awareness and robustness of FSPs' quality management practices such that cases are being identified and corrected proactively. However, this also coincides with the aftermath of the RTS scandal which cost their continuity in the forensic marketplace.[175]

3.2.2 Challenges of the FSR role and emerging issues

3.2.2.1 Insufficient Resources for regulatory duties

A persistent challenge to the FSR role has been the constraints to undertaking some regulatory duties due to inadequate funding and workforce capacity to support the work of the Regulator. The

[173] Tully, *Forensic Science Regulator Annual Report 2015* (n 140); Tully, *Forensic Science Regulator Annual Report 2016.* (n 159).
[174] Tully, 'Forensic Science in England & Wales, a Commentary' (n 109).
[175] House of Lords Science and Technology Select Committee (n 6), p.16.

Regulator has been supported by a team of civil servants (five scientists) (as of 2020) with additional support provided by shared services from the Home Office and Home Office Science Secretariat. According to the Regulator, both financial and workforce capacities in support of the work of the FSR are insufficient, and this, in turn, challenges the ability of the Regulator to execute some high-priority works or execute them within appropriate timelines. Table 3.2 below details the number of financial resources that have been provided to the FSR since 2008. The Table provides evidence of the annual decrease in financial resources to the FSR and by more than half between 2008/09 and 2019/20.

Table 3.2. The allocation of funding to the FSR between 2008 to 2019/20.

Year	**2008/09**	**2012/13**	**2013/14**	**2015/16**	**2016/17**	**2017/18**	**2018/19**	**2019/20**
Admin. budget (£k)	742.5	466	409	363	290	374.684	470	474
Prog. budget (£k)	571.5	430	265	245	257.17	150	100	25
Total (£k)	1,314	896	674	608	547.17	524.684	570	499

Given the rate of budget fall over the years, it was reported that the role of the FSR was "rapidly [becoming] unsustainable" such that unless budget for the FSR is stabilised, the ability of the Regulator to fulfil functions was being substantially impacted.[176] A pick-up in funding for administrative purposes, including for staff pay between 2017/18 and 2018/19 may have been triggered by the continuing difficulties that were lamented by the Regulator, including the Regulator working increased hours.[177] However, in 2019/20, the budget has been cut to the "disappointment" of the Regulator. It is reported that the increasing trend quality-related issues being reported to the Regulator demands extra work, staff and money for travel, investigation of failures and development of additional quality standards and guidance documents. This challenge has manifested during the investigations of contemporaneous cases of laboratory failings. The Regulator has reported that in the face of an ever-greater number of quality-related referrals and

[176] Tully, *Forensic Science Regulator Annual Report 2016.* (n 159), p.43.
[177] Tully, *Forensic Science Regulator Annual Report 2017* (n 162).

ongoing support required for FSPs working towards achieving the requisite quality standards, more resources not fewer are required for the work of the FSR.[178]

3.2.2.2 Lack of statutory regulatory powers

One of the concerns of the FSR role since 2012 has been the lack of statutory regulatory powers. The implications of this have been reiterated in almost all the reports which were reviewed. According to the Regulator, without statutory powers to enforce compliance with accreditation, the FSR role cannot guarantee that all forensic sciences being used in the CJS are being carried out to the required quality standards.[179] Thus, the 'ineffectiveness' of the FSR role has been attributed to the lack of statutory powers. A Government consultation in 2013 raised concerns about some potential high-risks of voluntary regulation.[180] These included the future possibility for accreditation requirements to be removed from forensic service procurement agreements due to pressure from both police forces and FSPs to reduce costs. Another prospective high-risk was the possibility for both police forces and commercial providers to fail to comply with the Regulator's Codes or to refuse compliance with an investigation or suggested improvements instigated by the Regulator following a serious quality breach. These concerns have, therefore, demanded statutory powers for the Regulator. The Government pledged to provide the FSR role with some statutory footing to provide a level playing field for all service providers, both public and private, by making compliance compulsory, to ensure reliable and robust scientific evidence to the CJS.

3.2.2.3 The FSR Bill 2018 and delays

The Bill which proposes statutory powers for the FSR role has been introduced, known as the Forensic Science Regulator Bill 2018.[181] The Bill proposes powers for the Regulator to publish a Code of Practice which defines the specific forensic science activities to which the Code applies. The powers are also proposed for the Regulator to investigate (Section 5) and to issue a compliance notice (Section 6) to a person whose practice creates a substantial risk to safe criminal proceedings. The failure by a person to act in accordance with the Code is not of itself liable to civil or criminal proceedings. However, some provisions in the Bill suggest an attempt to mandate compliance with the Code. These include the provisions for a court to take into account non-compliance with the Code. (Section 4(3)). Also, the grounds for the Regulator to issue a discretionary compliance notice

[178] Tully, *Forensic Science Regulator Annual Report 2019* (n 145).
[179] Tully, *Forensic Science Regulator Annual Report 2017* (n 162).
[180] Home Office, *Consultation on New Statutory Powers for the Forensic Science Regulator* (Crown Copyright 2013 2013) <https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/256614/New_statutory_powers_for_the_forensic_science_regulator.pdf> accessed 4 April 2018.
[181] Forensic Science Regulator Bill 2018.

and to conduct investigations into one's practice include the non-compliance with the Code. (Section (6(5). The purpose of Compliance notice is to demand corrective steps which may be required by the Regulator, including the prohibition of practice by recipients until the required steps are taken within a specified time.

The Bill also makes provisions for appeal by addressees of compliance and prohibition notices. The FSR Bill is a Private Members' Bill, which means they have been introduced by individual MPs or members of the Lords rather than by the Government. This defeats the Government's promise in its highly criticised 'forensic science strategy' to providing statutory powers to the FSR.[182] Perhaps, this could be part of the reason why, to the disappointment of the Regulator, there is no definite plan for government legislation of the FSR Bill, as of February 2020. According to the Regulator, the delay in legislating the FSR Bill has, in no doubt, resulted in slower progress towards compliance with quality standards, particularly in very small companies and police forces.[183] Recent reports have described the delays in providing statutory powers to the FSR role as "embarrassing";[184] "unacceptable" and a failure by the Government to show leadership.[185] According to the Regulator, delays to legislating the FSR Bill "can only now be interpreted as a lack of priority being given to forensic science quality by the Government."[186]

3.2.2.4 Lack of data about the impact of quality standards

According to the Regulator, the assurance of sustainable competence of FSPs to produce valid results with clear limits of knowledge and/or methodology can only be achieved through the proper application of quality standards.[187] A high priority of the FSR role, therefore, is to continue to publish quality standards, including the delayed standard for the evaluation of scientific evidence. This is to ensure that a systematic approach to quality covers all scientific activities from the crime scene to court. However, the Regulator has acknowledged a gap in knowledge about the impact that the FSR quality standards are having on the quality of forensic science. As of 2018, one of the high priority areas of work for the Regulator was to monitor this through the review of actions raised during the accreditation process, formal and informal complaints and referrals, and court judgments in relation to expert evidence.[188] As of February 2020, it was reported that an evaluation

[182] Home Office (n 100).
[183] Tully, *Forensic Science Regulator Annual Report 2019* (n 145).
[184] House of Lords Science and Technology Select Committee (n 6), p.29.
[185] House of Commons Science and Technology Committee, 'The Work of the Biometrics Commissioner and the Forensic Science Regulator' (2019), p.11, <https://publications.parliament.uk/pa/cm201719/cmselect/cmsctech/1970/1970.pdf> accessed 19 August 2020.
[186] Tully, *Forensic Science Regulator Annual Report 2019* (n 145), p.13.
[187] Tully, *Forensic Science Regulator Annual Report 2017* (n 162).
[188] Tully, *Forensic Science Regulator Annual Report 2019* (n 145).

of the impact of accreditation of digital forensics has shown that accreditation has driven improvements across all aspects of digital forensics.[189] However, knowledge about the impact that the FSR Codes and accreditation have had on other disciplines of forensic science is still lacking. This provided a direction for this study, particularly, the second research question.

3.2.2.5 Non-compliance with accreditation requirement

For a long time, concerns have been raised about the inconsistencies in accreditation requirements between private FSPs and police forces. A bias in accreditation requirements has been attributed to inconsistent conditions around forensic service commissioning and procurement, which means that police in-house activities can avoid accreditation.[190] Yet, this coincides with an increasing and new areas of forensic science being carried out by police in-house facilities with some basic quality management systems (QMS) which were originally set for DNA screening and examination of biological materials and fingerprint analysis.[191] Thus, there is a gap in the quality management systems and the number of forensic science disciplines being carried out, generally, in policing. Reliance upon deficient QMS has, therefore, been linked to a risk of quality, including the possibilities that there may be a limited understanding of the limitations of some methods and processes for forensic service-provision that are being used in-house police laboratories.[192]

As described earlier, fingerprint enhancement and comparison services are provided in-house police laboratories and fingerprint bureaux. The Regulator's deadline for the accreditation of fingerprint activities was October 2018. However, by this deadline, a 'mass failure' was reported as only three police fingerprint bureaux were able to achieve accreditation. In March 2019, a new regulation, known as the 'Accreditation of Forensic Service Providers Regulations 2018' was implemented in England and Wales.[193] This regulation transposes the compulsory accreditation requirements of the EU Council Framework Decision 2009/905/JHA and is, therefore, outside the remit of the FSR role. This regulation requires all FSPs carrying out DNA and fingerprint analysis to be accredited to the ISO 17025. It also requires competent law enforcement authorities to use FSPs that hold accreditation to ISO 17025 for fingerprint and DNA analysis. It is reported that this legal requirement has provided a catalyst for the accreditation of police fingerprint comparison bureaux. As of February 2020, it is reported that all save five police bureaux have achieved ISO

[189] Tully, *Forensic Science Regulator Annual Report 2019* (n 145).
[190] House of Commons Science and Technology Committee, 'HC 610' (n 103), pp.25-28.
[191] House of Commons Science and Technology Committee, 'Forensic Science Strategy - Fourth Report of Session 2016-17' (2016), p.19.
<https://publications.parliament.uk/pa/cm201617/cmselect/cmsctech/501/501.pdf> accessed 25 October 2017.
[192] Tully, *Forensic Science Regulator Annual Report 2015* (n 140).
[193] The Accreditation of Forensic Service Providers Regulations 2018 2019 1.

17025 accreditation. For those who are not accredited, they are at different levels of preparing to be accredited and have made provisions for fingerprint matches from their bureaux to be checked at an accredited facility.[194] This new legal requirement which has been a catalyst for accreditation has also boosted the calls by the Regulator for statutory powers for the FSR role.

Overall, it is reported that even though the number of FSPs gaining accreditation are increasing, some organisations are not accredited for the full scope of forensic activities, and "it is still not possible to determine how many such organisations there are, offering services into the CJS without any systematic assurance of competence."[195] Non-accreditation or non-compliance in this context, therefore, implies either absolutely no accreditation or accreditation just to ISO standards but not to the Regulator's Codes (the latter more often the case). As of February 2020, it is reported that approximately 17 organisations in England & Wales who are regularly practising forensic science in the CJS are accredited to the ISO 17025 but not the Codes. Of these, 12 are in policing, with five accredited solely for digital forensics (three are small digital forensics companies and the remaining two are primarily instructed by the defence).[196] Limited accreditation and non-validation for digital forensic activities have been a persistent high-risk area.[197] The difficulties of accreditation have been ascribed to the validation problems caused by the ever-changing digital space.[198]

3.2.2.6 Inadequate funding for FSPs to invest in accreditation

Generally, non-compliance within policing has been attributed to the limited financial discipline (and motivation) and lack of commitment from senior levels to invest sufficiently in the required quality standards. Some evidence of this includes some police force authorities reportedly stating that: "[they] can deliver operational work or adopt the quality standards but not both".[199] Persistent lack of support for learning and improvement in quality has also been reported, where some problematic issues highlighted from old accreditation assessments are simply transferred into new areas. Further downward investment in quality has been attributed to cuts to police funding for forensic science, as well as the changing policing operational priorities. As a result, the achievement of quality in forensic science is competing for resources and against the demands of

[194] Tully, *Forensic Science Regulator Annual Report 2019* (n 145).
[195] Gillian Tully, *Forensic Science Regulator Annual Report 2018* (2019) <https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/786137/FSR Annual_Report_2018_v1.0.pdf> accessed 19 March 2019, p.25.
[196] Tully, *Forensic Science Regulator Annual Report 2019* (n 145).
[197] Tully, *Forensic Science Regulator Annual Report 2015* (n 140).
[198] James Vaughan, 'National Police Chiefs' Council – Written Evidence (FRS0053)' (2019) <http://data.parliament.uk/writtenevidence/committeeevidence.svc/evidencedocument/science-and-technology-committee-lords/forensic-science/written/89780.pdf>.
[199] Tully, *Forensic Science Regulator Annual Report 2016.* (n 159), p.8.

counter-terrorism, safeguarding and serious crime investigation. It is reported that although this may be understandable in terms of policing priorities, it questions the capability of the police to run their own forensic activities and their credibility of assuring the quality of evidence.[200] The evidence of difficulties with police accreditation has prompted the establishment of the Transforming Forensics Programme (TFP) within the Forensic Capability Network (FCN) in policing. Funding for the TFP and FCN has been confirmed in February 2020 to help police forces develop a nationally coordinated approach to forensic service provision, including for accreditation and QMS, instead of the individual approaches.[201]

For small-scale and sole/traded FSPs, a survey by the CSFS in 2015 provided an insight into the difficulties in achieving accreditation.[202] Across a section of 70 forensic scientists,[203] approximately 35% of the respondents indicated that they were either accredited or working towards accreditation whilst 65% held no accreditation. Again, about 48% indicated using written Standard Operating Procedures (SOPs) for their forensic activities, 9% used under-developed SOPs while 39% operated without any SOPs. The difficulties of accreditation have been attributed to the prohibitive cost of accreditation; the laborious accreditation process and lack of flexibility; the monopoly of UKAS accreditation; lack of expertise and guidance on ISO 17020 and 17025; lack of resources, such as peer-reviewers; and lack of mandatory accreditation.

3.2.2.7 Expensive cost of accreditation

The Regulator has indicated that "the single biggest challenge to achieving the aim of the FSR" is the financial cost associated with complying with and being assessed against the FSR Codes.[204] The cost of accreditation as of 2017 was reported to be between £7,000 and £17,000, depending on the readiness of the applicant's methods and processes for UKAS' assessment.[205] A unique challenge with the cost of accreditation has been the disproportionate cost between large-scale and small-scale/sole traded FSPs due to unequal level of funding and the size of organisations. The cost of accreditation is, thus, disproportionately higher for small-scale FSPs, some of which provide case review services for the defence. As of February 2020, the pilot exercise by the CSFS to develop an alternative scheme to assist small and micro-businesses to reach the necessary standards at a

[200] Tully, *Forensic Science Regulator Annual Report 2017* (n 162), p.10.
[201] 'Forensic Capability Network' <https://www.fcn.police.uk/> accessed 17 July 2020.
[202] The Chartered Society of Forensic Sciences, 'Interfaces Number 86' (2016) 86 <http://www.emagcloud.com/CSFS/interfaces_86/pubData/source/interfaces%20June%202016.pdf> accessed 5 April 2018.
[203] About 32% of the respondents were sole traders, 14% represented SME-small providers (50-249 staff), 34% for SME-micro (2-9 staff), 8% for SME-medium providers and 12% for large providers (250+ staff).
[204] Tully, *Forensic Science Regulator Annual Report 2016.* (n 159), p.6.
[205] Tully, *Forensic Science Regulator Annual Report 2017* (n 162), p.26.

more proportionate cost, including accreditation to the ISO 17020, has concluded that the ISO 17020 is an applicable standard for accrediting case review activities. However, it is reported that "the cost of such a system is not insubstantial and there remains a structural problem with implementing a standard for case review work that is primarily funded by the Legal Aid Agency (LAA)".[206] Since October 2011, the LAA rates are reported to have fallen between 38% and 73%, depending on the forensic discipline.[207]

3.2.3 Some quality-related consequences of commercialisation

3.2.3.1 Collapse of commercial service providers

All the reports reviewed captured some quality-related consequences of commercialisation of forensic service provision. One of the most serious risks to the quality of forensic science has been service providers exiting (often suddenly) the forensic market. Instances include the collapse of Forensic Telecommunications Services (FTS) Ltd in 2017 and the near-collapse of Key Forensics Services in 2018, who were both working on several cases for several police forces at the time of crises. Some of the serious risks that such collapses posed, as reported by the Regulator included an increased error rate during the transfer of service provision between providers; reduction in forensic capacity within the commercial sector; cuts to forensic submissions by police forces, starving the CJS from valuable forensic science of the required quality; evidence of unsustainable strain on staff working overtime; and the loss of skilled forensic science practitioners.[208]

3.2.3.2 Price-driven forensic service commissioning risks the sustainability of the forensic marketplace

The collapse of FSPs has been blamed on unsustainable funding due to substantial decreases in police expenditure on external forensic services and the 'bargain basement' prices levied for some services.[209] Further, several forensic science disciplines have almost entirely been moved to in-house police laboratories, shrinking the marketplace value. For the remaining outsourced services, there is a reported risk of uncertainty in service supply by private providers due to contractual defects. It is reported that due to the commoditised model of forensic service procurement, this has forced private suppliers to a point where they are competing so heavily on price. Coupled with the fear of the losing market share, competing private FSPs bring their prices down to an unsustainable level when bidding for service contracts, which are huge and come around infrequently. There is

[206] Tully, *Forensic Science Regulator Annual Report 2019* (n 145), p.27.
[207] Tully, *Forensic Science Regulator Annual Report 2017* (n 162), pp.9–10.
[208] Tully, *Forensic Science Regulator Annual Report 2018* (n 195).
[209] House of Commons Science and Technology Committee, *HC 855* (n 110).

also a 'winner takes all' approach which put some providers at the mercy of unstable sub-contracting by large-service providers. This has led to an increase in the vulnerability of small-scale providers, many of which are the sole providers of niche forensic disciplines.[210]

3.2.3.3 Deficient forensic science due to commoditisation

The impact of commercialisation on the quality of forensic science has also been linked to the increasing emphasis on commissioning specific routine forensic analysis. This has rendered forensic science as distinct product packages rather than an end-to-end process. Both the commoditised (product packages) and managed service (casework packages) approaches have been criticised for further increasing the complexities and specifications for forensic analyses to the detriment of a partnership approach between police forces and forensic scientists for better production and interpretation of forensic evidence. The risks have been characterised as the increasing fragmentation of forensic analysis, where exhibits from the same criminal investigation are distributed to multiple providers for discrete analysis, based on the cost of testing. In some cases, exhibits are reported to be submitted to service providers for analysis without any disclosures regarding case context or investigation strategy. Such disclosures are often reported as posing a risk of contextual bias for practitioners leading to potentially unsafe criminal justice outcomes.[211] The particular challenge of fragmentation is reportedly addressed in police forces where regional commercial partnership procurements are based upon an end-to-end partnership approach with private providers.

In 2015, the Regulator conducted a pilot casework review to determine the impact of forensic science commissioning and supply chain on the quality of forensic science provided to the CJS. Two police force collaborations were chosen and some rape cases that have been processed from crime scene to court were reviewed.[212] The findings highlighted the risks of inconsistencies in the way in which forensic science information (activity-level: what caused evidence to be found on an item) were used by police forces to inform investigative strategies. The undertaking of initial evaluative strategy decisions of cases and the level of skills and experience of police personnel in charge of forensic evaluative decisions were found to be inadequate.[213] The findings of the Regulator's pilot casework review was similar to previous reports by the House of Commons in 2011[214], that often police forces prefer cheaper options during service commissioning, such that the

[210] House of Lords Science and Technology Select Committee (n 6).
[211] House of Commons Science and Technology Committee, 'HC 610' (n 103), p.18.
[212] Tully, *Forensic Science Regulator Annual Report 2015* (n 140).
[213] Tully, *Forensic Science Regulator Annual Report 2016.* (n 159).
[214] House of Commons Science and Technology Committee, *HC 855* (n 110), p.22.

commissioning would favour 'forensic testing products' more than 'interpretation products' because the latter is expensive. This is because interpretation products are reportedly expensive as they require further 'additives', such as investment in an individual's knowledge, scientific research, and innovation. This means that, because of commoditisation, police forces seem interested in finding the source of evidence instead of the activity level which is the more important aspect of successfully solving a crime.

3.2.3.4 Service commissioning dis-incentivises investment in quality by FSPs

The commissioning and tendering processes of forensic science have been reported as posing challenges to investment in quality by private FSPs. Some contractual conditions, such as service delivery penalties based on 'service credit regime' with no rewards for consistency or reliability in service delivery have been criticised as disproportionate penalties which may affect the quality of services provided. Also, for outsourced 'total services' contracts which are procured on 'zero inflation' terms over a long-term basis, there is a real barrier to investment in accreditation.[215] There is also a real cost deterrence on value-added services which may improve the quality of evidence, such as research and development activities. For police in-house services, instances of case discontinuation by police forces because of the lack of sufficient resource allocation for police forensic units to achieve the required quality standards to undertake forensic analyses have been reported. There are also reports of police forces awarding contracts from FSPs without accreditation, including the commissioning of digital forensic services. This approach is reported to dis-incentivise FSPs to invest to achieve accreditation and to operate to the required quality standards.[216]

For forensic services for the defence, it is reported that some 'experts' are being instructed repeatedly (and in some cases paid from public funding) when they are not providing a high quality, independent review service. In some instances, experts have been criticised by courts for their practices, yet they continue to be instructed and continue with similar practices.[217] According to the Regulator, even though a quality standard for case review for the defence is required, there is a structural issue with requiring a quality standard in this area because much of the work is funded by the LAA and there is no current requirement placed on instructing solicitors to require any form of quality assurance from FSPs who provide services for the defence.[218] There is, thus, an issue of

[215] House of Lords Science and Technology Select Committee (n 6), p.18.
[216] Tully, *Forensic Science Regulator Annual Report 2018* (n 195), p.12.
[217] Tully, *Forensic Science Regulator Annual Report 2016.* (n 159).
[218] Tully, *Forensic Science Regulator Annual Report 2017* (n 162).

systemic and contextual factor which impact upon the FSR role and the achievement of quality defence forensic service provision.

3.2.3.5 SFR pose risks to evidence reliability

Between 2014/15 and 2018/19, the Regulator has reported that sporadic referrals had been received about SFR1s because of their inappropriate use in court proceedings. Thus, their usage is found not to be in accordance with the CPR and CPD. According to the Regulator, "in several cases, this has led to evidence being ruled inadmissible."[219] As of March 2019, the Regulator reported that several referrals continue to be received about SFR1s being used in court even when the evidence has not been agreed by all parties.[220] Instances have also been reported where some police forces refuse to pay for scientists to produce an admissible statement of evidence. Rather extracts from abbreviated reports, which are specifically marked up as being for investigative use and not for evidence, are pasted into evidential statement format and produced as evidence.[221] There are also reported instances where scientists have made a request to police forces for approvals to prepare an evidential report that will comply with the CPR, but these are refused by the police. As a result, FSPs have, in some cases, created the required reports at their own cost. As of February 2020, it was reported that the continued usage of abbreviated reports appears to be because of service provision contracts, where FSPs are required to include an abbreviated report without additional charge.[222] While these cases are reported as entirely unacceptable actions that are occurring, the reports do not indicate the extent to which police are influencing the content of forensic scientists' reports, including the prevalence of such possible actions across areas outside the SFR.

It is reported that scientists are being summoned on a "regular basis" to give evidence on the basis of an SFR1 in court proceedings, when they are not supposed to, per the CPR requirements.[223] The Regulator, therefore, indicates that scientists are led or expected to give evidence without having had the opportunity to go through the formal process of developing a scientifically supported inference that has appropriately undergone a peer-review to check the accuracy of results and conclusions. It is also reported that even though the CPR and CPD set out a firm foundation for the use of expert evidence in the CJS, which if applied rigorously, would further decrease the risk of erroneous results being relied upon in a criminal case, there is little evidence that the Rules are being consistently applied. As a result, SFR increases the risks to the quality of forensic science

[219] Tully, *Forensic Science Regulator Annual Report 2016.* (n 159), p.39.
[220] Tully, *Forensic Science Regulator Annual Report 2018* (n 195).
[221] Tully, *Forensic Science Regulator Annual Report 2017* (n 162), pp.12.
[222] Tully, *Forensic Science Regulator Annual Report 2019* (n 145), p.35.
[223] Tully, *Forensic Science Regulator Annual Report 2018* (n 195), p.31.

where unsound science could be accepted as expert evidence without the requisite scrutiny.[224] This may be seen as also potentially short-circuiting the gatekeeping tasks undertaken by judges or evaluation of the evidence by juries.

3.3 Discussion of document analysis

3.3.1 Achievements of the Regulator

The documents review aimed at identifying some of the factors which impact upon the FSR role and affect the operations of the Regulator. This was intended to understand how the successive Regulators have been able to fulfil the role of the FSR. Some of the achievements of the Regulators were found, in terms of developing a wide range of quality standard documents for different activities across different forensic science disciplines, including those that apply to the national DNA database. This is in (partial) fulfilment of the primary regulatory objective of ensuring that the appropriate quality standards are in place for all forensic science disciplines. This achievement can only be partial given that gaps remain in the development of some essential quality standards, such as standards for the evaluation of forensic evidence, which has been pending as a high-priority area for the Regulator.

However, overall, as has been evidenced by the rate at which the FSR Codes are being updated, including with guidance documents as appendices, there is an indication of the swift response by the FSR role to changes both in the relevant laws within the CJS and developments in the forensic science sector. The successive Regulators have even engaged with other international standards developing organisations in their development of quality standards, including the OSAC in the US and ENFSI in Europe.[225] Overall, the operations of the Regulator suggests the building of a purpose-driven regulatory process through varied engagements with the forensic science sector and the CJS.

In terms of monitoring the accreditation of FSPs, the rate at which FSPs are gaining and maintaining accreditation to the Regulator's Codes should measure the rigour and efficacy of the Regulator's enforcement strategies. The Regulator's reports indicated that, overall, the number of FSPs gaining accreditation to the FSR Codes has been increasing. However, gaps in accreditation persist across police crime scene examination, some police force in-house laboratory activities, some small-scale and sole-traded FSPs and other forensic disciplines, such as digital forensics, which has lagged far behind the timescale for accreditation. Over the years, the Regulators have advised Ministers and

[224] Tully, *Forensic Science Regulator Annual Report 2017* (n 162).
[225] Tully, *Forensic Science Regulator Annual Report 2015* (n 140), p.15.

stakeholders about the risks to the quality of forensic science associated with these gaps in accreditation. These have fed into the discussions and introduction of the FSR Bill, which is conceived to help improve the ability of the Regulator to compel accreditation across areas where the non-compliance with accreditation persists.

In terms of dealing with complaints of quality failures, even though the FSR role lacks the powers to investigate or compel FSPs to report cases of quality failures, the reports indicate an increasing number of quality failures and some of the high-risk cases which have been investigated by the successive Regulators, with the assistance of the police and the concerned FSPs. The efforts by the FSR role to encourage the reporting of quality failures through anonymous reporting by FSPs and the public is commendable, as it shows the interest of the FSR role to address the risks posed by cases of quality failures. The purpose of investigations and publicising of investigative findings has been to disseminate information which might provide guidance or clarity to other FSPs and practitioners to trigger some changes and improvement in practice across the wider forensic community. Also, the Regulator has high expectations in the ability the FSR Codes to reduce the risk of recurrence of quality failings and to facilitate good practice through accreditation, because of claims that the Codes are based on substantial learning from good practice and errors and failings in the field of forensic science.[226] As a result, the effectiveness of the FSR role should not only be examined through the number of investigations conducted or the quality standards being developed, but also how these tend to challenge and help FSPs to address the recurrence of quality failings and errors and identify areas for changes and improvement in their practice. However, this information was found lacking.

3.3.2 Challenges facing the FSR role

It was found that some challenges related to the weakness of the institutional structure of the FSR role tend to weaken the ability of the Regulator to execute some high-priority works or execute them within appropriate timelines. The issues include the inadequate funding and workforce capacity to support the work of the Regulator and to align regulatory activities with the increasing and changing quality-related demands on the FSR role. Specifically, inadequate funding for regulation was liked to problems with finalising the quality standard for the evaluation of forensic evidence, as well as the investigation of the increasing number of reported quality failures. It was also found that the challenges with achieving satisfactory progress and a level playing field of accreditation across all FSPs have been attributed to the lack of statutory powers for the FSR role. Experts' recommendations prior to the establishment of the FSR role did not rule out statutory

[226] Tully, *Forensic Science Regulator Annual Report 2019* (n 145), p.28.

powers for the Regulator. The view was that "if the Regulator is to have powers, these must be enforceable and whether self-regulation or legislation is the better course will only become clear after an initial scheme not relying upon legislation has had time to identify and deal with the problems which will arise." [227] Thus, over the years, non-compliance with accreditation by some FSPs has been mainly used to portray the weaknesses of the voluntary regulatory requirements, particularly during the debate surrounding the move to put the FSR role on a statutory footing and provide the FSR with enforcement powers.

However, in the same breath, the Regulator has reported that the single biggest challenge towards achieving the purpose of the FSR role is the cost of complying with accreditation. This means that the impact of the cost of accreditation cannot be underestimated, in terms of its contribution to the issues of non-compliance with accreditation and the unfulfillment of the role of the FSR. This cost is particularly more expensive for small-scale FSPs and police forces—where compliance has generally been problematic—due to their inappropriate funding level to be able to get accredited (on time). The Regulator has reported that the difficulties of accreditation are due to the fact that all FSPs across the board—that is, defence service provision, commercial FSPs and police forces are poorly supported by the forensic science sector in which they are working and are significantly under-funded in their provision of forensic science.[228]

It was apparent in the reports that due to the inappropriate funding for forensic service provision, coupled with the interest of police forces to pursue the best value (price) during forensic service delivery commissioning, spending on forensic science appears to produce some knock-on effects more broadly on the forensic marketplace, which interferes with some forensic service supply condition. This, further, dis-incentivises the required prioritising and investment in the meeting the Regulators' standards. This means that even though the risks to sustainable forensic service provision due to financial problems exist for both police and private providers, greater difficulties, perhaps, exist for private providers, given the demands of competing for 'survival' in a shrinking marketplace, and the profit demands. This suggests that investing in quality assurance and accreditation is poorly (if at all) rewarded, giving rise to a real risk of business unsustainability.

The challenges with the successful monitoring of accreditation by the Regulator imply that any attempts to address the challenges facing the fulfilment of accreditation across the board of FSPs should take a comprehensive view of the multiple factors which impact upon accreditation. Without

[227] Rawley and Caddy (n 127), pp.14-15.
[228] Gillian Tully, 'FSR Newsletter No.30' <https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/757909/FSR Newsletter_No30_nov2018_final.pdf> accessed 19 August 2020.

such comprehensive view, it may be difficult to conceive that the Regulator can improve the accreditation of FSPs if the FSR role is given statutory powers to enforce accreditation to the detriment of providing the adequate funding and support for FSPs to afford the expensive accreditation assessment. However, it seems that in the demands for statutory powers for the Regulator, the consideration for a comprehensive view may be lacking. This is discussed further in section 3.3.5.

3.3.3 The FSR role and the quality of forensic science

The FSR annual reports strengthened the argument that the expected end goal of the FSR role is more far-reaching than the mere accreditation of FSPs. It has been emphasised by the Regulator that the reason for publishing quality standards is to provide a means to an end goal. The end goal includes the achievement of a process of forensic science service provision, from the crime scene to court that is conducted by competent forensic scientists, according to scientifically valid methods and reported transparently to the courts.[229] The available data in the reports reviewed provide much evidence about the measures being put in place by the FSR role to achieve this end goal; however, there is little evidence of the extent to which this end goal is being achieved. This is due to the notable lack of data about how the Regulator's quality standards impact the quality of forensic science.

The Regulator has strongly stated that "accreditation to a quality standard is neither the beginning nor the end of improving quality".[230] This means that understanding the respective impact of the FSR role on the quality of forensic science is also more complicated than whether FSPs are accredited or not. As has been defined by the Regulator, some stated or implied needs of the CJS which forensic science services are expected to satisfy should, first, help to assess the quality of forensic science, and, second, the respective impact of the FSR role.[231] The Regulator has pledged to monitor the latter through "the review of actions raised during the accreditation process, formal and informal complaints and referrals, and court judgments in relation to expert evidence."[232] While this indicates an attempt to assess the impact of the Regulator's quality standards, there is lack of clarity about what the terms of reference are for these assessments and, most importantly, whether the assessments may consider or satisfy the needs of the CJS identified in the previous chapter.

[229] Tully, *Forensic Science Regulator Annual Report 2019* (n 145).
[230] Tully, *Forensic Science Regulator Annual Report 2019* (n 145); p.11.
[231] The Forensic Science Regulator, *Codes of Practice and Conduct* (2020), p.76.
[232] Tully, *Forensic Science Regulator Annual Report 2018* (n 195), p.8.

Notwithstanding, the evidence available in the Regulator's report provides preliminary information about the remit of these assessments.

In terms of the strength of the proposed approach adopted by the FSR, feedback from UKAS accreditation assessment helps to raise some issues, such as whether the procedures and validation of methods by FSPs are in conformance with the FSR Codes or not. Instances of non-conformances have been picked up as a result of this feedback and reported to the Regulator.[233] The issues of non-conformances of FSPs' procedures and validation process are concerning because of their implications on some of the CJS' requirements for the delivery of forensic services. For instance, validation of methods is the process of providing objective evidence that a method, process or device used by FSPs is fit for the specific forensic purpose.[234] Therefore, any problem with the validation of forensic methods used by FSPs raises questions about the appropriateness of that method to be fit for the forensic technique or task for which it is used.

However, accreditation feedback alone may be an insufficient approach to assess the impact of regulation on other indicators of quality forensic service provision, such as the integrity, impartiality and accuracy of FSPs and practitioners at every stage throughout the process of service provision. Generally, accreditation will provide information about the potential of FSPs to meet these objectives based on evidence that they have got the procedures in place. However, some risks, such as related to intentional malpractices and misconduct may, still, be irremediable even with accreditation in place. This has been exemplified in the cases of high-risk quality failures which have occurred in accredited FSPs. It is clear that these cases, when they occur, affect the confidence that the CJS and the public have in the quality and reliability of forensic science, because of the bad publicity they generate.[235] In terms of the implications on the FSR role, quality failures raise questions whether cases may be widespread; whether the accredited methods and procedures for checking the accuracy and integrity of forensic results at various FSPs are doing what they are supposed to do; and, hence the effectiveness of the Regulator's quality standards. These cases, therefore, tend to dilute the achievements of the FSR role. Further, accreditation feedback alone cannot uncover how other non-regulatory factors impact the quality of the work of FSPs.

Notwithstanding, cases of quality failures portray some positive outlook; an increasing number of quality failures being reported by FSPs to the Regulator does provide the means for addressing the risks of quality failures. The reporting of quality failures is a voluntary requirement, like

[233] Tully, *Forensic Science Regulator Annual Report 2016.* (n 159), pp.25 – 26.
[234] The Forensic Science Regulator (n 138), p.78.
[235] BBC News, 'Randox Forensics Inquiry: Forty Drug-Driving Offences Quashed' *BBC News* (6 December 2018) <https://www.bbc.com/news/uk-england-manchester-46466710> accessed 5 August 2020.

accreditation, hence, their increasing numbers is a positive outcome for the Regulator. However, the current quantitative data monitoring of these indicators only provides broad surface information about the performance of the FSR and the compliance of FSPs. They do not offer an in-depth understanding of how the FSR role and compliance of FSPs impact the work of individual FSPs, including whether FSPs are seeing some benefits or otherwise of compliance with the regulator's requirements for accreditation and other quality assurance measures. Ultimately, the evidence suggested that the knowledge of how the FSR role is impacting the work of FSPs to meet the requirements of the CJS concerning the delivery of forensic services may, not yet, be fully explored and understood or being overlooked because of limited monitoring of the impact of the FSR role.

3.3.4 Commercialisation and the quality of forensic science

It was reported in the FSR annual reports that non-compliance with accreditation makes it impossible to guarantee that all forensic sciences being used in the CJS are being carried out to the required quality standards. However, the quality-related consequences of commercialisation demonstrated the risks to the quality of forensic science which are not necessarily due to quality standards, accreditation of FSPs (whether accredited or not) or the actions of the FSR role. The precarious forensic marketplace impacts the quality of forensic service provision in a different dimension through the commissioning and tendering approaches of forensic services, for both prosecution and defence. Apparently, due to cuts to police funding for forensic science, the forensic service commissioning process generally favours cheaper prices to the detriment of some features that may improve the quality of the forensic services. Overall, it appears that for the sake of police forces' apparent interests in cheaper prices, achieving a forensic service delivery process that meets the needs of police as the specific customer and the requirements of the CJS as a whole simultaneously may conflict.

It was found that the FSR role has no remit over the cost, prices and the timescales of forensic service delivery. However, in addition to their in-house service provision, police forces have considerable control over the extent to which they would rely on forensic science during investigations, through outsourcing of forensic services. It was found that the tendering process and procurement conditions have rendered forensic science as a menu of distinct specific products which police forces choose from as they wish, at a negotiable price with private FSPs and delivery timelines.[236] This cost-saving approach is also similar to how the use of SFR is reportedly being 'abused' in the CJS, and appears to give less attention to forensic service delivery process where FSPs can apply scientific rationality holistically, by interpreting forensic evidence as well as

[236] Lawless (n 101), p.74.

producing it.[237] Thus, on one hand, commercialisation appears to satisfy the cost and operational needs of police forces, as the 'customers' of forensic science. However, on the other hand, this appears to give little attention to the provision of forensic service that reflects the understanding of the requirements of the CJS as a whole. Both of these findings challenge the supposed existence or the need for support and coordination between the FSR role, forensic marketplace and the SFR to achieve quality-related objectives for forensic service provision.

3.3.5 The FSR Bill to improve the role of the FSR and the quality of forensic science?

It is reported that very few Private Members' Bills (such as the FSR Bill) become law but, by creating publicity around an issue, they may affect legislation indirectly.[238] As a result, the passage of the FSR Bill to law remains unpredictable, as delays persist and no timelines have been developed by the Government for its legislation. However, if the FSR Bill is to be legislated, there remain concerns about the appropriateness of the proposed statutory powers to achieve their perceived purposes. For instance, during the Government's consultation for statutory powers for the FSR role, the need to "avoid imposing unreasonable or impracticable bureaucratic burdens on organisations (that is, FSPs)" was raised.[239] This was in light of the observed co-operation of FSPs towards complying with accreditation requirements and reporting complaints of quality failures even under voluntary regulation. Also, the Government highlighted the need to avoid burdening the Regulator and FSPs with associated costs, in terms of compliance and issuing sanctions for non-compliance.[240]

However, with the challenges of widespread financial difficulties faced by FSPs, across the board, and the weaknesses and pressure on the Regulator due to limited workforce capacity and financial resources, powers for the FSR role to conduct investigations, issue compliance notices to compel accreditation or to prohibit the practice of FSPs for non-accreditation presents an additional potential burden to both FSPs and the Regulator. This suggests that the effectiveness of statutory compliance notices to improve (timely) accreditation of FSPs may not be as straightforward as envisioned, given that the inadequacy of financial resources of FSPs directly affects their accreditation. Moreover, given the ripple effect that FSP's exit from the precarious forensic marketplace has on the entire CJS,[241] the appropriateness of prohibition powers as a sanctioning

[237] Lawless (n 101), p.74.
[238] 'Private Members' Bills' (*UK Parliament*) <https://www.parliament.uk/about/how/laws/bills/private-members/> accessed 23 July 2020.
[239] Home Office (n 175), p.14.
[240] Home Office (n 180).
[241] Carole McCartney and Louise Shorter, 'Police Retention and Storage of Evidence in England and Wales' (2020) 22 International Journal of Police Science & Management 123.

method for non-accreditation should be interrogated. Also, the limited workforce capacity and funding provided to the FSR role should not be underrated in terms of how they can impact on the ability of the Regulator to execute the proposed statutory investigative powers in the FSR Bill.

Also, in light of the adverse implications that the forensic science procurement approaches and the SFR have on the quality of forensic service provided by FSPs, any attempt at assessing the (in)effectiveness of the FSR role or reforming the FSR role must appreciate the powerful effect of external non-regulatory factors. However, the focus of the proposed statutory powers in the FSR Bill appears to quantify the problems of quality forensic science in terms of accreditation of FSPs alone. Addressing the difficulties of the FSR role to enforce the accreditation of FSPs is a good idea. However, the implications of financial difficulties and other structural defects related to the wider holistic process of forensic service provision, such as the introduction of SFR and the cuts to the LAA for defence forensic science to the effectiveness of the proposed regulatory powers need further exploration. Neglecting the significance of these factors in the discussions about the effectiveness of the FSR role and the FSR Bill can be a huge miss.

3.4 Conclusion of document analysis

The purpose of the document analysis was to gain insights of the structural and contextual factors which impact upon the FSR role and affect the work of the Regulator. The analysis has provided insights into the achievements, challenges and emerging issues faced by the Regulator, and the other issues from the wider forensic science sector which pose risks to the quality of forensic science. However, in the context of the aim of this study, the data from the document analysis alone are insufficient to conclude whether the FSR role is fit to improve the quality of forensic service provision, from the crime scene to court. The evidence from this chapter has, nonetheless, provided the direction for further research questions to probe the fitness of the FSR role in improving the quality of forensic science.

Firstly, there is evidence that the Regulator is able to provide the necessary framework of quality standards for different forensic science disciplines, including those that apply to the National DNA database, due to the strong engagement between the FSR role and the forensic science community. The Regulator also continues to provide advice to Ministers and the Home Office, which has fed into major inquiries on forensic science, as well as other matters touching upon forensic science. These include the inability of the Regulator ensure that the accreditation of FSPs to the Regulator's quality standards is equally achieved across the board of FSPs of different sizes and from different sectors, due to the lack of statutory powers for the FSR role. Notwithstanding, the number of FSPs

gaining and maintaining accreditation to the FSR Codes is reportedly increasing amidst serious financial difficulties faced by all FSPs. The number of cases of quality failures being reported by FSPs to the Regulator is also increasing. The Regulator is also able to investigate some cases of quality failures. However, due to inadequate funding and workforce capacity in support of the FSR role, the Regulator has limited capacity to match the ever-greater number of quality-related referrals being reported and to provide ongoing support for FSPs who are working towards achieving the requisite quality standards.

Secondly, it was found that the Regulator's programme of work is intended to provide support and enhance the ability of FSPs to meet the requirements of the CJS concerning the delivery of quality forensic services. For this reason, all FSPs are expected to comply with the FSR role and its quality standard requirements. There have been proposals to monitor the impact of the Regulator's quality standards on the quality of forensic science provided by FSPs. However, this proposal has not been fully executed and a gap in knowledge remain about the impact the FSR role may be having on the work process of FSPs. Attempts by the Regulator to assess effectiveness have focused on some quantitative performance indicators which merely reinforce the measures being put in place by the FSR, including the development of quality standards, accreditation, and investigation of quality-failings. However, these data do not directly, in of itself, provide indisputable evidence that the quality of forensic science has been improved as a result of these measures. The approach of monitoring the effectiveness of the FSR role, therefore, appears to lack a clear framework in terms of providing evidence of how the requirements and actions of the Regulator impact the work of FSPs to meet the requirements of the CJS concerning the delivery of quality forensic services.

This gap is further exacerbated by the publicising of high-profile quality-related failures. Also, cost-saving forensic procurement approaches by police forces and the inappropriate use of SFR tend to favour police needs. However, the amount of forensic science being used in the CJS and the requirement to satisfy the needs of the defence may be short-changed. These findings raise questions about whether some structures and processes intended to support and coordinate with the FSR role to achieve quality-related purpose may be functioning as expected. There are grounds, therefore, to pose the second research question to examine the impact of regulatory requirements and interventions, and other non-regulatory factors, on the quality of the work of FSPs. This is required to establish a relationship between the achievements of the FSR and improvement in the quality of forensic science being produced on the ground across different FSPs.

Thirdly, the document analysis has revealed some uncertainties concerning the provision of statutory powers for the FSR role, including what appears to pose a burden on both FSPs and the

Regulator. This concerns the financial difficulties faced by both the FSR role and the wider community of FSPs, which impact both the work of the appointed Regulator and affect the quality of forensic science. There is evidence suggesting that the demands for statutory regulatory powers may be potentially more inward-looking than taking a holistic approach to address the systemic problems which pose risks to the quality of forensic service provision. This means that the assessment of the implications of other factors which has the potential to affect the effectiveness of the FSR Bill may not have received the necessary attention. To address any potential bias in the assessment and the demand for the FSR Bill and the goals envisioned for the proposed statutory regulatory powers, there are grounds to pose the third research question. The objective is to explore the changes that statutory regulatory powers could bring to the regulation and the quality of forensic science service provision. This is in the context of the wider landscape of forensic service provision and the system-wide factors which interfere with the quality of forensic service provision.

Chapter 4. Impact of regulation on the quality of forensic science: a literature review

This chapter explores the relevant literature about the impact of regulation and quality assurance programmes on the quality of forensic science. The purpose of the literature review was to gain insight into the theoretical underpinning concerning the relationship between quality assurance regulation and the quality of services; the methodological approaches for determining the impact of regulation on the quality of service; and the indicators to look for to evidence regulatory impact on quality. One of the unique features of this study was indeed the composition of this literature review. Literature from both forensic science and closely related fields were reviewed. This was necessitated because the literature search revealed an insufficient directly comparable study on the impact of the FSR role on the quality of forensic science. As a result, the literature search was necessarily broadened beyond the forensic science field.

In using the 'non-forensic-based' studies, the attention was focussed on the general theories and methodologies for assessing the impact or effectiveness of regulations which have quality assurance and improvement objectives as the FSR role. The literature from outside the forensic setting was, therefore, used to identify essential themes, which may transcend the FSR role and the forensic science setting and can be relied on to frame the appropriate data collection approach of this study. The insights drawn from the literature were, therefore, used to develop the theoretical, conceptual and methodological frameworks on how best to investigate the impact that the FSR role is having or has had on the quality of forensic science service provision in England and Wales.

An electronic literature search was conducted from online research databases, using a set of keywords and phrases generated from the research topic and the research questions. These are shown in Table 4.1 below. Given the broad nature of the keywords and phrases, literature about forensic science regulation in the UK/England and Wales were found to overlap with other literature from other disciplines, regulatory fields and countries. The relevant literature which concerned the impact of regulation or any quality assurance programmes on the quality of services was then reviewed in a narrative approach.

Table 4.1. Keywords for online literature search

Impact Effectiveness Fitness Performance	Of forensic science	Regulation Regulator Accreditation Quality standards Oversight Reform Governance	In the UK In England and Wales

4.1 Theoretical views about the impact of regulation on the quality of service

The impact of regulation is also often described as or used interchangeably with 'effectiveness' or the 'performance' of regulation. These descriptions are used to signify the capacity of regulation to achieve its intended purpose. Two main theoretical perspectives which underpin regulatory effectiveness were found, namely, the unidimensional and mediation perspectives. The unidimensional view is based on the assumption of attribution, suggesting that regulatory interventions are the sole determinants of the achievement of intended regulatory outcomes. As a result, where the outcomes of regulation deviate from expected goals, more stringent regulatory interventions may be recommended.[242]

However, this view was found to be limited in explaining the effectiveness of regulators who have quality-related purposes. This is because, in regulating for the quality of services, the intended quality-related objective of the regulator is either to assure or improve the quality of services.[243] The achievement of these objectives can only be determined through the activities of the regulated service providers, and not, necessarily, directly by the activities of the regulator.[244] Notwithstanding, the regulator's interventions, rules and requirements are essential to guide the activities of the regulated organisations in line with the desired goals of the regulator. As a result, the effectiveness of regulation to achieve quality-related outcomes is explained by the mediation principle, where the quality assurance interventions of the regulator are viewed as a treatment to achieve outcomes. The achievement of regulatory outcomes will be dependent on the interactions between the regulatory interventions and the setting in which they are implemented. The latter comprises the organisational culture of service providers and their processes for service provision,

[242] Baldwin, Cave and Lodge (n 11), pp.105 – 111.
[243] Kim Sutherland, Shelia Leatherman, and Health Foundation (Great Britain), *Regulation and Quality Improvement: A Review of the Evidence* (Health Foundation 2006).
[244] Norman Johnson and others, 'Regulating for Quality in the Voluntary Sector' (1998) 27 Journal of Social Policy 307.

and external forces, such as from service users or a market, which determines the conditions for service demand and supply.[245] This view of regulatory effectiveness is represented in Figure 4.1 below.

[245] National Audit Office, 'Performance Measurement by Regulators' (2016) <https://www.nao.org.uk/wp-content/uploads/2016/11/Performance-measurement-by-regulators.pdf> accessed 3 August 2018.

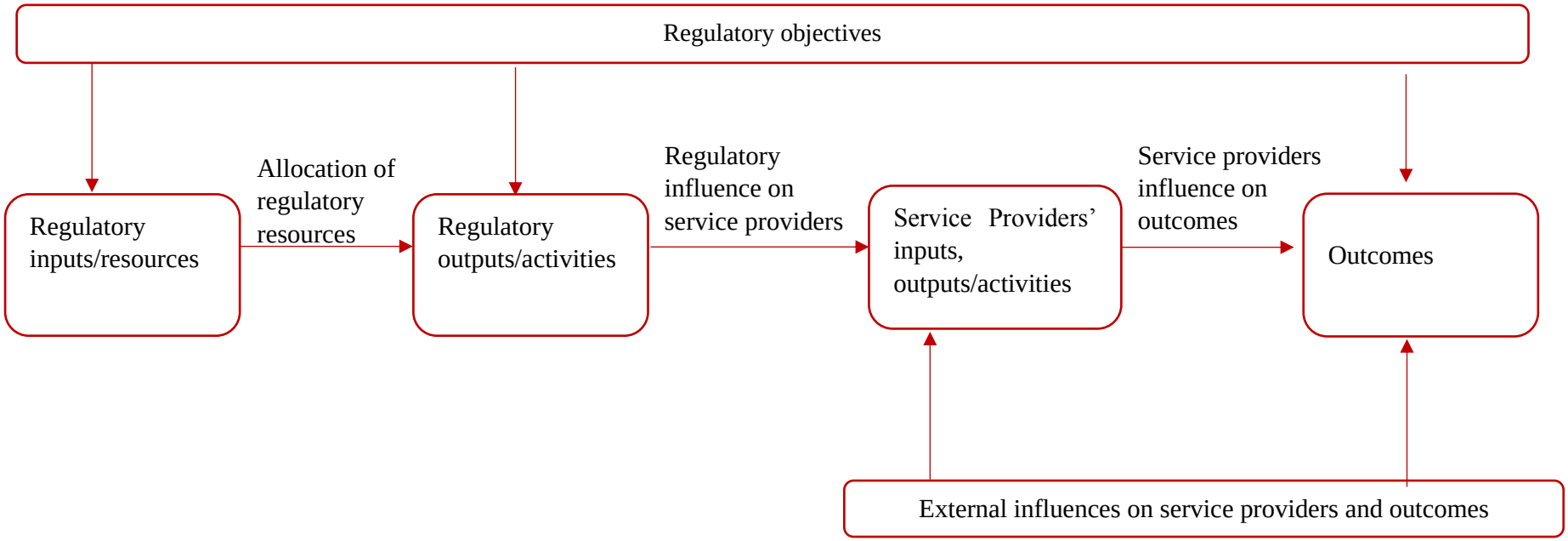

Figure 4.1. Model of regulatory effectiveness. Source: The National Audit Office.[246]

[246] National Audit Office (n 245).

From the figure above, it might be difficult to identify all the keys to effective regulation. The locus for regulatory effectiveness and ineffectiveness may be due to problems related to the regulator, the response of regulated organisations or some disruptive factors from the demand and supply of services. It is further asserted that the problem may be found to lie potentially in more than one of these loci.[247]

4.2 Methodological approaches for assessing the impact of regulation on quality

Generally, different assessment criteria can be monitored for regulatory effectiveness. One criterion commonly focused on is the input-based assessment which probes into issues such as how the Regulator initiates and implements programmes and actions and the resources devoted to that. Secondly, process or compliance-based assessment may be carried out to measure how regulated organisations comply with regulatory rules, requirements and guidelines. However, two important criteria that are less commonly measured are the output and outcome-based assessments. These criteria, respectively, measure the extent at which the goals of specific regulatory interventions are being achieved and the extent at which these goals reflect the overriding purpose of the regulator. The importance of output and outcome-based assessment is that findings attempt to link regulatory outcomes to regulatory purpose, escalating the connection between regulatory action and effect on the ground.[248]

These descriptions mean that the criteria for evaluating effectiveness will be a matter of choice, depending on the purpose of the evaluation. The output/outcome-based criterion was relevant to this study. This approach of evaluating regulatory effectiveness is commonly known as the ex-post evaluation because it determines whether regulation is achieving the purpose for which it was created or whether regulatory interventions do impact on the regulated organisations in an intended way. [249] To determine this, the consensus has been to utilise some outcome-based indicators that are relevant to the purpose of the regulation.[250] This is based on the assumption that the only justification for judging effectiveness is the achievement of the ultimate outcomes of concern to the regulation.

For regulators with quality-related objectives, it was found that the purpose of the regulation, thus, quality assurance or quality improvement is difficult to define in a single comprehensive criterion,

[247] Brownsword and Goodwin (n 10), p.61.
[248] Baldwin, Cave and Lodge (n 11), 38-39.
[249] Cary Coglianese, *Measuring Regulatory Performance - Evaluating the Impact of Regulation and Regulatory Policy* (2012) <https://www.oecd.org/gov/regulatory-policy/1_coglianese%20web.pdf> accessed 29 January 2018.
[250] Cary Coglianese (n 249), p.12.

because of the multiple possible dimensions and criteria to define quality. This makes it remarkably difficult to determine the regulator's impact on the provision of services and whether the interventions of the regulator are yielding the desired purpose. Notwithstanding, it is suggested that an evaluation of whether quality assurance or improvement goals have been achieved should be based on the conceptual and operationalised definition of 'quality of service'.[251] This will help in identifying the benchmark or indicators that are appropriate to evaluate the impact of regulatory interventions.

As has been defined already, quality signifies the degree to which a set of inherent characteristics of a process, product, service, or system fulfil a certain requirement.[252] Given these multiple perspectives for defining quality, discussion of indicators for assessing the regulatory impact on quality can be somewhat abstract, and as a result, the choice of indicators can be highly nuanced and even at times controversial.[253] For service provision, quality is commonly defined and assessed from the perspective of either as a 'process' of service provision or as the 'outcomes' of that process. Based on this, the effectiveness of regulation on the quality of service can be ascertained from the perspective of regulatory impact on the process of service provision or the outcomes of that process. This is because both outcomes and process-based indicators can ascertain whether regulation is achieving its intended outcomes. However, it is argued that process-based features are more relevant at measuring regulatory effectiveness than the outcome-based features. This is because, as the regulator's interventions will firstly impact on the process of service provision, which will, in turn, shape the outcomes of that process, ascertaining the impact of regulation on the process of service provision may be more important.[254]

Notwithstanding, using some features of the outcomes of services, such as customer or service-users' satisfaction of services is considered to be the best way to ascertain whether quality service has finally been provided to customers. However, understanding the quality of service and/or the impact of regulation using this approach is difficult because customer's satisfaction may be affected by several factors, unrelated to the process of service provision or the actions of the regulator.[255] Customer satisfaction can also be affected by customers' own expectations. To assess the respective impact of regulation on improvement in customer satisfaction will, therefore, require that all the

[251] Avedis Donabedian, 'Evaluating the Quality of Medical Care' (2005) 83 The Milbank Quarterly 691.
[252] ISO, ISO 9000:2015, Quality Management Systems – Fundamentals and Vocabularies, Available at https://www.iso.org/obp/ui/#iso:std:iso:9000:ed-4:v1:en. (Accessed 07/10/19).
[253] Cary Coglianese (n 249), p.17.
[254] A Donabedian, 'The Quality of Care. How Can It Be Assessed?' (1988) 260 JAMA 1743.
[255] Donabedian, 'The Quality of Care. How Can It Be Assessed?' (n 254).

other factors which have the same effect on customer satisfaction as regulation be held constant. However, this will be difficult, if not impracticable to do.

On the other hand, focusing on the features of the process of service provision by service providers is relatively easier to ascertain whether the appropriate service has been applied. Further, because regulator's quality assurance/improvement interventions are, generally, targeted at the structures and processes of service providers, process-based indicators make it easier to ascertain the impact of regulation on the quality of service provision. The objective is to measure some changes in the processes and methods of service provision. A positive change is indicative of improvement in the quality of the process of service provision, also known as improvement in practice. This can be measured by focusing on the changes in the internal processes and systems, commitment, responsibility and culture for the quality of the service providers. These changes will be achieved through the positive behavioural modification and action-based experiences as a result of the compatible relationship between the three influencers of quality (as captured in Figure 4.1).[256]

The advantage of process-based indicators of quality is, therefore, the ability to determine whether the process of service provision has improved, the respective impact of regulation, and the components of regulation that are responsible for positive changes in service provision. However, process-based indicators may be weak in determining whether the improvement in practice has yielded the intended outcomes on service users. Also, regulation and other external factors can cause both unintended effects on the process of service provision. Therefore, to gain a comprehensive understanding of the impact of regulation through process-based indicators, it is suggested that both intended and unintended impact of regulation and other external factors must be ascertained.[257]

4.3 Quality assurance programmes and the quality of forensic science service

The general theoretical explanations and methodologies for assessing the effectiveness of quality assurance regulation were found to overlap with the views in the forensic science setting. For a bespoke evaluation of regulatory effectiveness, Maguire *et al*.[258] have suggested the use of indicators that can measure the achievement of regulatory goals. For regulators who aim to assure and/or improve the quality of forensic science, a concern, however, is the difficulty to clearly define

[256] Stephen Atkinson and others, 'Defining Quality and Quality Improvement' (2010) 10 Clinical Medicine 537.
[257] Donabedian, 'Evaluating the Quality of Medical Care' (n 251).
[258] Chris Maguire and others, 'Efficiency and the Cost-Effective Delivery of Forensic Science Services: Insourcing, Outsourcing, and Privatization' (2012) 3 Forensic Science Policy & Management: An International Journal 62.

what counts as an outcome of assurance and/or improvement in the quality of forensic science. This is compounded by the fact that it is normally impossible to identify the 'ground truth' in the context of criminal cases where forensic science is used. Secondly, it is noted that quality assurance regulators may often use multiple interventions to achieve outcomes of quality assurance and/or improvement. Hence, a difficulty may arise when trying to determine which intervention may be responsible for a negative or positive impact on quality. Thirdly, interventions for achieving quality assurance or improvement objectives may be designed to incentivise, encourage or promote certain conduct and behaviours among service providers. Identifying what counts as 'effective' regulation, in such an instance, could be imprecise, because, the benchmark for effectiveness can be set too high, such that it can risk judging regulation as ineffective; or, the threshold of effectiveness can be set too low to describe whether improvement has been achieved and the respective involvement of regulation.[259] Instances of each are captured below.

4.3.1 Impact on court outcomes

Some evaluation studies in the UK have linked the quality of forensic science directly to the outcome of criminal investigations, effective trials and measures that may prevent and/or reduce crime.[260] For the FSR role, these metrics may pose as benchmarks of effective regulation, because of the expectations that the Regulator's quality standards should reduce the risk of forensic science quality failings, wherever these may occur, which may impede or prevent the identification, prosecution and conviction of offenders.[261] Thus, one might perceive a relationship between the Regulator's quality standards programmes and guidelines and the impact of forensic science evidence on criminal investigations and effective trials. However, evaluation of effectiveness which utilises these outcomes can be too high and problematic for the Regulator. This is because, the work of FSPs are not only limited to forensic evidence in court; there are several aspects of the criminal investigations for which forensic science can make an input,[262] and which the FSR role can also make an impact. Hence using the court outcomes alone can miss other important criteria which can be used to assess the quality of forensic science and the impact of the Regulator's quality standard programmes and guidelines.

[259] Brownsword and Goodwin (n 10), pp.275 - 278.
[260] Her Majesty's Inspectorate of Constabulary, *Valuing the Police: Policing in an Age of Austerity* (2010) <https://www.justiceinspectorates.gov.uk/hmicfrs/media/valuing-the-police-policing-in-an-age-of-austerity-20100720.pdf> accessed 20 March 2018.
[261] Rennison, 'The Forensic Science Regulator Business Plan 2008/09 - 2010/11' (n 7), p.19.
[262] Sonja Bitzer, Pierre Margot and Olivier Delémont, 'Is Forensic Science Worth It?' (2019) 13 Policing: A Journal of Policy and Practice 12.

Besides, there is also the high probability that many different and uncontrolled variables within any criminal investigations and trial process where forensic science is used can impact on the outcome of investigations and trials. Hence attributing court outcomes, whether positive or negative, on forensic science alone can be erroneous.[263] This difficulty has been highlighted by Houck,[264] that CJS outcomes, whether it be a case dropped, a conviction, an acquittal, or even a wrongful conviction, may be markers of 'success' or 'failure' for police and prosecutors for which forensic science can make a necessary but not sufficient input. As a result, these indicators are insufficient markers of forensic science quality or its effectiveness in the CJS. This suggests that using outcomes or features of forensic science from the courts' perspective alone to gauge the effectiveness of the FSR role can be imprecise.

Roberts[265] has made clear the difficulties in assessing the quality of forensic science from the view of forensic service users. It is argued that the police, CPS and defence lawyers who 'purchase' forensic science services can only judge the quality of forensic science in terms of whether scientific evidence assists in reaching a trial verdict (whether it be a conviction or acquittal). However, taking a broader view, it is argued that, even, the most useful prosecution evidence does not necessarily represent the highest social value (and quality) of forensic science. It is possible that a prosecutor's or defence's "satisfaction" with forensic science may be biased by whether the forensic evidence supported their case or not. Hence, the value and quality of forensic science will vary contextually, such that what may constitute good quality forensic evidence for one customer would not be considered in the same light, by another.[266] These debates further elaborate on how irrelevant it could be if the effectiveness of the FSR role is judged from the perspective of how forensic science evidence impact on some court outcomes alone. However, there are also instances where the threshold of regulatory effectiveness can be artificially imposed, such as the view that the higher the number of a particular feature or activity, the better or the higher the quality of service.[267] Some of these are explained below.

4.3.2 The number of accredited FSPs

As described earlier, the commonest approach to regulating the activities of FSPs is through the accreditation of FSPs to the ISO standards ISO/IEC17025:2017. Where accreditation is enforced

[263] William King and Edward Maguire, 'Assessing the Performance of Systems Designed to Process Criminal Forensic Evidence' (2009) 1 Forensic Science Policy & Management: An International Journal 159.
[264] Max M Houck, 'Strategic Leadership through Performance Management: FORESIGHT as PerformanceStat' (2017) 0 Australian Journal of Forensic Sciences 1.
[265] Roberts, 'Making Forensic Science Fit for Justice' (n 27).
[266] Roberts, 'Paradigms of Forensic Science and Legal Process' (n 42).
[267] Brownsword and Goodwin (n 10), p.277.

by external regulation, the number of organisations gaining and maintaining accreditation may be used as a measure of quality or improvement in quality. For instance, following the implementation of the Council Framework Decisions 2009/905/JHA and 2008/616/JHA, which require the mandatory accreditation of FSPs across EU Member States, a study has examined the extent to which these laws are being implemented across EU Member States.[268] The study provides evidence of how mutual recognition of forensic science quality standards may be increasing across EU member states. However, it does not show whether there has been a corresponding evidence of improvement in the quality of forensic science practice across these Member States, such as whether increasing accreditation has improved some features of forensic science practice than before.

Nogel *et al*.[269] have acknowledged this limitation, explaining that establishing the forensic science mutualisation programmes in Europe, through the Framework Decisions, was more complicated than just to ensure that forensic laboratories will be accredited. Rather, the purpose of the mutualisation programmes was to enable the mutual exchange of knowledge and expertise and, hence, an improvement in uniformity across the whole forensic expert system and the basics of the criminal evidence law across Member Countries. This suggests that until there is evidence to demonstrate improvement and uniformity in the mutual exchange of knowledge and expertise across the whole forensic expert system, it may be difficult to judge the impact or fitness-for-purpose of the mutual quality standards and accreditation programmes.

The need for information about improvement in forensic science practice and quality assurance, and not necessarily the number of accredited FSPs, has been highlighted by the findings of a previous study about the status of forensic science accreditation in Europe. Using quantitative questionnaires, a study in 2007 found that of 52 respondent forensic science laboratories in Europe, more than 65% were not accredited. Even for the accredited laboratories, the study found ambiguity in the understanding of the meaning, the purpose and principles of quality assurance and accreditation.[270] These findings demonstrate that the approach of simply counting the number of accredited laboratories as a measure of improvement in forensic science quality, and the effectiveness of regulation which enforces accreditation, is flawed.

[268] Pádár, Nogel and Kovács (n 89).
[269] Mónika Nogel and others, 'A Work in Progress - Accreditation of Forensic DNA Laboratories as a Part of the "European Forensic Science Area 2020 (EFSA 2020)" Concept' (2019) 7 Forensic Science International: Genetics Supplement Series 836.
[270] Ekrem Malkoc and Wim Neuteboom, 'The Current Status of Forensic Science Laboratory Accreditation in Europe' (2007) 167 Forensic Science International 121.

In the US, a similar approach exists with demonstrating the quality of forensic science through the number of accredited crime laboratories. A survey of crime laboratories in 2014 showed that since 2002, the proportion of accredited crime laboratories has increased across all jurisdictions. This report highlighted that of about 409 public forensic laboratories in the US, 88% were accredited; 98% conducted proficiency testing; 75% had written standards for employee performance, and 94% maintained a written code of ethics. These data were collected to examine the changes and stability in the operations of crime laboratories serving federal, state, and local jurisdictions.[271] Although the data show an increase in accreditation and provide evidence of compliance of FSPs with quality standard requirements, they cannot solely explain whether the overall quality of forensic science has also been improved.

Also, using the number of accredited FSPs as the measure of improvement in the quality of forensic science demonstrates a further misunderstanding of effectiveness. In the US, it is noted that enforcement of accreditation of crime laboratories varies across States, including voluntary or mandatory accreditation. Without discernible evidence of improvement in quality caused by accreditation, it may be difficult to weigh the need for (more) stringent regulation or mandatory accreditation. This is because other factors unrelated to efforts to improve or assure the quality of forensic science may explain FSPs' motivation for complying with accreditation. In the US, for public-funded FSPs to be eligible for some grants from Federal and State forensic science funding programs, such as the Paul Coverdell Forensic Science Improvement Grants Program, applicant laboratories must meet requirements, including certificates of accreditation.[272] These requirements, arguably, could indicate that compliance with accreditation could be motivated by funding. As a result, equating an increase in the number of accredited organisations with quality improvement can be problematic.

Anecdotally, ISO quality standards and accreditation in forensic science are considered as the means to demonstrate to the courts that scientific analysis and outcomes are underpinned by robust systems and processes within a suitable environment.[273] However, in a recent paper, the work of OSAC in the US who approve and maintain a registry quality standards for forensic science service provision has been criticised. Criticisms have indicated that the quality standards published by OSAC are vacuous, meaning they generally state few requirements and the requirements are often vague. Further, it has been observed that compliance with the requirements through accreditation

[271] Andrea M Burch and others, 'Publicly Funded Forensic Crime Laboratories: Quality Assurance Practices, 2014' (Bureau of Justice Statistics 2016) <https://www.bjs.gov/content/pub/pdf/pffclqap14.pdf> accessed 11 March 2018.
[272] https://nij.ojp.gov/funding/coverdell-national-forensic-science-improvement-grants-program
[273] Brown and Willis (n 2).

can be achieved with little effort because they set a very low bar and, hence, compliance with the quality standard requirements cannot be sufficient to lead to scientifically valid results.[274]

The NAS report in 2009 warned about this notion of equating accreditation to the assurance of forensic science quality or the performance of FSPs. The report stated that accreditation only signifies that the system that defines the various processes of activities within laboratories is present. It also stressed that accreditation is only an aspect of an overall quality management system that must be complemented with other quality control and assurance measures.[275] Citing these reasons, Lentini[276] argues that accreditation should neither be a self-assessment program for forensic science laboratories nor the sole form of oversight for their activities. This is because of limitations, including weaknesses of accreditation in guaranteeing error-free practice or in providing safeguards against personnel misconduct or negligence.

Wilson-Wilde[277] suggests that the ultimate purpose of quality standards and accreditation is not for the individual forensic service provider. Rather, they are to provide confidence to police and the judicial system that the forensic services provided by laboratories are fit for purpose and undertaken at an appropriate level of quality. However, King and Maguire[278] disagree with this assertion and argue that quality standards and accreditation are only input measures for forensic science laboratories. They argue that quality standards are weak unless they are coupled with some type of enforcement mechanism for accreditation. Further, they point that accreditation can sometimes be pursued by laboratories for their symbolic value rather than (or in addition to) their substantive value for improving performance. They conclude, then, that the dichotomy of whether a laboratory is accredited or not does provide a textured measure of performance capable of enabling the comparison of laboratories to one another or tracking a laboratory's performance over time.

These arguments point that quantifying the number of quality standards and accreditation as improvement in the quality of forensic service provision can be meaningless unless the information is coupled with evidence regarding certain outcomes, including how they have helped improve the performance of the procedures and operations of service providers. This is based on the assumption that accreditation and other quality assurance interventions are useful tools for driving changes in

[274] Geoffrey Stewart Morrison, Cedric Neumann and Patrick Henry Geoghegan, 'Vacuous Standards – Subversion of the OSAC Standards-Development Process' [2020] Forensic Science International: Synergy <http://www.sciencedirect.com/science/article/pii/S2589871X20300462> accessed 1 July 2020.
[275] National Research Council (n 82).
[276] Lentini (n 51).
[277] Linzi Wilson-Wilde, 'The International Development of Forensic Science Standards — A Review' Forensic Science International <https://www.sciencedirect.com/science/article/pii/S037907381830166X> accessed 23 April 2018.
[278] King and Maguire (n 263).

the operations and procedures of forensic science providers. According to Lucas,[279] accreditation should ensure continuous improvement in the processes and systems of forensic service provision by helping laboratories analyse problems within their practice and taking corrective actions. For the FSR role, these arguments suggest that focusing on some impact or outcomes of accreditation and other regulatory guidance, in terms of how they help individual FSPs to undertake their forensic science practices and meet or achieve certain performance targets should be the appropriate way of assessing the impact of the FSR role on the quality of forensic science. Some of these are discussed below.

4.3.3 Impact on the process of forensic service provision

4.3.3.1 The crime scene perspective

King and Maguire[280] have suggested some indicators for measuring the performance of FSPs across crime scene activities, laboratory analysis and evidence delivery to forensic science service users (investigators, prosecutors, judges). For crime scene activities, the ability of crime scene investigators to find, secure and process crime scenes; and to properly submit physical evidence for analysis are some of the suggested features for assessing whether the objectives of crime scene examination have been met. It is suggested that such information can be obtained by interviewing or surveying crime lab personnel and crime scene investigators. Thus, given that the FSR role requires that FSPs who undertake crime scene examinations are accredited to the ISO 17020, FSPs could be asked to share their experiences, in terms of how accreditation helps them in carrying out their crime scene activities.

However, in terms of the decisions and subsequent submission of physical evidence for laboratory analysis, the evidence from the document analysis chapter indicates that the FSR role has no input concerning these decisions. Rather, this is within the remit of police forces and procurement approaches. Bandy and Hartley[281] has reported a study by the Open University's Centre for Policing Research and Learning in 2018, which assessed the impact of the police's spending review on the sustainability of the forensic marketplace, through semi-structured interviews with stakeholders from police forces, private FSPs, the Home Office and the FSR and data from published reports of police force budget and spending on forensic science. The study found that comprehensive spending review by police forces and competition between private FSPs have resulted in price

[279] Douglas M Lucas, 'Global Forensic Science Collaboration: Standards and Research' (2011) 2 Forensic Science Policy & Management: An International Journal 148.
[280] King and Maguire (n 263).
[281] Gary Bandy and Jean Hartley, 'Debate: When Spending Less Causes a Problem' (2018) 38 Public Money & Management 52.

reductions for forensic services and have caused pressure on both FSPs' turnover and profitability and sustainability of the forensic marketplace. Yet, it was found that turnaround times for forensic tests and the quality of the work of FSPs have improved. The study did not provide the details of the features which were used to measure 'improvement in quality'. Notwithstanding, this may not include the 'proper submission' of physical evidential materials for analysis in the laboratories, as evidence from the document analysis showed that, generally, this is adversely affected by police budgetary constraints.

4.3.3.2 Laboratory processes and activities

Often, the impact of accreditation and quality standards on laboratory-based forensics is measured. It is suggested that this information can be obtained by interviewing or surveying laboratory personnel about how workable they find their processes and systems of service provision after accreditation.[282] Some of the features that can be focused on include laboratories' speed of analysis, size and age of backlogs, workable ways to expedite cases and analyses and accuracy of analyses.[283] Some methodological approaches for assessing the impact of quality assurance programmes and evidence of improvement in the context of internal laboratory processes and analysis are available, with examples reported by individual laboratories across a period of time.

In one case study, the benefits of a composite quality management system, comprising accreditation, competency testing, proficiency testing, and internal peer-review were reported in a forensic anthropology laboratory in the US. Formalised internal peer-reviews were identified as having had the biggest positive impact on the laboratory. These were found to have provided the opportunity for the laboratory to critically scrutinise its casework activities, which exposed some problems in the laboratory's reports to customers, the deficiencies of scientists' competency, and deviations of the analytical process from the lab's Standard Operating Procedures (SOPs).[284]

The benefits of such an internal review have been highlighted in a case study across six police laboratories in Australia. Face-to-face interviews with members in the laboratories, after the internal review program, identified that the process had engaged the staff and encouraged a sense of shared ownership. The laboratories also reported a more streamlined quality system than what

[282] King and Maguire (n 263).
[283] King and Maguire (n 263).
[284] Michael W Warren, Traci Van Deest and Kristina Ballard, 'Quality Assurance as Pedagogy for Academic Forensic Anthropology Laboratories' (2011) 2 Forensic Science Policy & Management: An International Journal 70.

they had been using for the previous two decades. The laboratories, thus, highlighted a mature quality management practice and improved performance.[285]

Hueske and Wayland[286] surveyed the experience of eleven managers of crime labs in Texas, USA, concerning how mandatory accreditation has impacted on their crime labs. While all participants agreed that mandated accreditation has had a positive impact, it was found that accreditation increases turnaround time, with less time for working on cases due to more paperwork and funding issues. It was also found that even though staff within laboratories resisted mandatory accreditation, the process was supported over time because of agreement that it greatly assists in establishing credibility for their respective laboratories, both internally and externally.

However, in light of the notion of building the external credibility of laboratories, it has been recognised that laboratories may, sometimes, view quality assurance practices merely as strict adherence to protocols rather than as a means for improvement. A study has observed an increasing trend in accreditation schemes for forensic science laboratories which tend to persuade laboratories of a need for external credibility rather than for internal improvements in quality.[287] This was observed through interviews with thirteen respondents, comprising lab managers, scientists, and technicians from three forensic science laboratories in Canada. The study observed that some preparations for accreditation by laboratories were largely driven by a motivation to maintain outward credibility. Because of this, it was found that the quality assurance routines within the laboratories assumed a bureaucratic approach, which tended to favour 'self' rather than 'peer' assessment. This was identified as having displaced experimentalism and active questioning of forensic science.

In forensic science, experimentalism and questioning or judgement are important because evidential samples that are analysed in laboratories are not uniform but vary in interpretation from case to case. As a result, testing and analysis should be done by addressing the underlying reasons for examinations that suit the case circumstance. This means that forensic practitioners may, sometimes, be required to employ reasoning and interpretation, in addition to following laid down

[285] James Robertson and others, 'A Quality System Review: Australian Federal Police Forensic and Data Centres' (2010) 1 Forensic Science Policy & Management: An International Journal 209.
[286] Edward E Hueske and Julia Wayland, 'State Mandated Accreditation of Texas Crime Laboratories: A Look Back and a Look to the Future' (2011) 2 Forensic Science Policy & Management: An International Journal 135.
[287] Myles Leslie, 'Quality Assured Science: Managerialism in Forensic Biology' (2010) 35 Science, Technology, & Human Values 283.

protocols for forensic analysis. It, therefore, becomes problematic if individuals become too reliant on SOPs and are forced to follow strict guidelines and ignore the needed judgement.[288]

Willis[289] charted the changes that accreditation brought over some time in one laboratory. It was reported that staff carried out work according to agreed methods and there was a systematic approach to instrument maintenance and validation. The changes, in turn, boosted staff morale and pride in doing things right and in a much more open approach. There was also an increase in uniformity in casework activities. However, the drawback of accreditation was that even though in the non-accredited state, quality was individual practitioners' responsibilities and the methods of analysis could be varied by practitioners in charge of analysis, the accredited system resulted in strict adherence to procedures even when some variation was needed.

As part of maintaining accreditation, laboratories may either voluntarily or through the demand of external regulator/agency undertake some quality assurance programmes for ongoing improvement, such as to test the competency of personnel and the functioning of laboratory methods. For instance, in the USA, the NAS report recommended that laboratories partake in proficiency testing and certification, in addition to mandatory accreditation. Kolowski *et al.*[290] examined data from a proficiency test provider between 2008 and 2015 to determine whether the recommendations put forward by the NAS report was having a positive impact on U.S-based laboratories. Using proficiency test enrolment dates, the study found that there was no marked increase in laboratories' enrolment in proficiency testing. However, it found that there was an increase in the number of proficiency test results submitted by laboratories to support their ongoing accreditation. This may suggest that while laboratories can proactively be taking part in proficiency testing without being forced to so by any external regulator, they may be more willing to report the number of proficiency tests to support their accreditation because of recommendation or external pressure.

Wilson-Wilde *et al* [291] examined more than 3,100 proficiency tests undertaken between 2005 and 2015 by Australian government service providers, to determine the accuracy rates and error rates across 21 forensic science disciplines. The study found that even though practitioners knew they

[288] Sheila Willis, 'Accreditation — Straight Belt or Life Jacket? Presentation to Forensic Science Society Conference November 2013' (2014) 54 Science & Justice 505.
[289] Sheila Willis, 'The Highs and Lows of Accreditation' (2011) 2 Forensic Science Policy & Management: An International Journal 75.
[290] Jason Kolowski and others, 'Proficiency Testing Trends Following the 2009 National Academy of Sciences Report, "Strengthening Forensic Science in the United States: A Path Forward"' (2016) 7 Forensic Science Policy & Management: An International Journal 98.
[291] Linzi Wilson-Wilde, Stephen Smith and Eva Bruenisholz, 'The Analysis of Australian Proficiency Test Data over a Ten-Year Period' (2017) 8 Forensic Science Policy & Management: An International Journal 55.

were being examined for proficiency test (i.e. open/declared testing), errors were still being made. The study concluded that trends in proficiency test results need to be monitored and not necessarily the enrolment in proficiency testing. This is because, while enrolment may not necessarily mean practitioners or laboratories are less prone to making errors, monitoring the trend in test results will provide the opportunity for laboratories to review and pay attention to gaps in staff competency at conducting accurate analyses.

Hundl *et al*.[292] reported that after implementing blind testing at the Harris County Institute of Forensic Sciences, Texas, USA, the laboratory was able to appropriately gauge the proficiency of staff and the procedures used during analysis. The programme helped the laboratory to test their entire QMS to reveal any opportunities for improvement throughout their system. This suggests that where laboratories partake in proficiency testing for their enrolment sake or to fulfil external regulatory demand, this may be of no benefit until efforts are made by laboratories to address gaps in staff's competency at performing accurate testing and analysis or producing accurate results.

For all FSPs in England and Wales, Section 27 the FSR Codes (Issue 5) require them to participate in appropriate proficiency test schemes to monitor the validity of their forensic examinations and their performance, both against individual FSPs' own requirements and against the performance of peer FSPs. This is to demonstrate the ability of FSP's to assure the quality of test results. FSPs are also required to report any unexpected performance in proficiency testing to the FSR.[293] However, studies which assess the impact of regulatory requirements, both on FSPs enrolment in proficiency testing and the subsequent impact on FSPs' competency at performing accurate testing and analysis or producing accurate results is lacking. In addition to monitoring the trend of FSPs enrolment in proficiency testing, interviewing FSPs or comparing trends in proficiency test results should help understand whether the purpose of proficiency testing is being achieved.

4.3.3.3 The process of service delivery to service users

Houck[294] suggests that instead of focusing on the impact of forensic science services on the CJS outcomes alone to gauge the performance or the quality of the work of FSPs, some features based on the process of delivering the services should also be focused. This suggests using both process and outcome-based features of quality. The advantage of using both process and outcome-based features is the ability to determine the extent to which goals have been met, and the extent to which processes are yielding outcomes. For the FSR role, process-based features, in terms of how it affects

[292] Hundl and others (n 80).
[293] The Forensic Science Regulator (n 143).
[294] Houck (n 264).

FSPs' delivery of final forensic evidence to the CJS can be an appropriate outcome-oriented impact of regulation. This is because, the Regulator has developed the Legal Obligation guidance, which explains in detail the obligations placed on expert witnesses by the CJS.[295] This, in addition to the CPR and CPD, is intended to guide FSPs to deliver evidence that meets the requirements of the CJS. Asking FSPs for their experiences about the impact of the FSR guidance on their ability to deliver evidence to the court should provide evidence of the effectiveness of the FSR role in this area of forensic science.

A study has surveyed the experience of criminal barristers to ascertain how amendments to the CPR and CPD concerning the admissibility of expert witness evidence in court impact on their ability to critique the quality of forensic evidence.[296] The study found that 31% of the respondents had no knowledge of the amended rules or the CPD. Of the 70% that were aware, 75% indicated that they were familiar or very familiar with them. However, 75% indicated that the amendments had little or no effect on how the admissibility of evidence was dealt with in the cases they were involved in. Also, 56% indicated that the amendment would not affect their likelihood to challenge expert evidence or would make it less likely. Therefore, to help to fully implement the changes in the CPR and CPD, the study highlighted the need for more training for barristers to improve their confidence when assessing expert evidence.

Insights can be drawn from this study that asking FSPs what they think of the FSR role and any regulatory requirement or guidance can reveal areas where improvement may be needed to help fully implement the requirements of the FSR role to achieve the goals of regulation. Some of the recommended indicators to assess whether FSPs are delivering services to the CJS or service users in an appropriate manner includes the extent to which FSPs disseminate the results of forensic analyses and conclusions in a digestible manner. It is, therefore, suggested that one could survey police officers, investigators, prosecutors, and judges, to gauge their understanding of the information they receive from the FSPs. It is also suggested that a random sample of reports by FSPs can be reviewed to gain insight into this information.[297]

4.3.3.4 ISO quality standards and improvement

It was also necessary to gain insight from other literature about the relationship between ISO quality standards and the quality of services of accredited organisations. The ISO standards ISO 9000 and

[295] Forensic Science Regulator, 'Legal Obligations: Issue 8'.
[296] Gemma Davies and Emma Piasecki, 'No More Laissez Faire? Expert Evidence, Rule Changes and Reliability: Can More Effective Training for the Bar and Judiciary Prevent Miscarriages of Justice?' (2016) 80 The Journal of Criminal Law 327.
[297] King and Maguire (n 263).

ISO 17025 were focused upon because of their overlap with the FSR Codes. Some of the indicators which have been used to assess the impact of accreditation on the quality of services include the impact on customer satisfaction, employee satisfaction, laboratory performance and the image of the laboratory.[298] Apart from the differences in the use of indicators, there are divergent views about the correlation between accreditation and improvement in the quality, from service products and customers satisfaction perspectives. The evidence of an automatic relationship between accreditation and improvement in the quality of services provided to customers is unsupported in the literature.[299]

One study assessed the relationship between accreditation and improvement in quality by monitoring changes in the production process, organisational results, customer satisfaction, personnel motivation, and investment on means of achieving quality.[300] Between a group of more than 190 accredited and non-accredited service providers, the study found no significant difference in improvement across these indicators, except for investment in quality which favoured unaccredited organisations. However, within the group of accredited organisations, a significant difference in the production process was found between organisations who were internally motivated to gain accreditation and those who were externally compelled to gain accreditation. Internally motivated organisations experienced more improved production process in the form of increased throughput time; increased technical flexibility; improved coordination of activities; improved quality of product specifications; increased internal delivery performance; increased external delivery performance; and improved efficiency. This study provides an instance where process-based indicators are more relevant at assessing the impact of an external quality assurance programme on the quality of service-provision than outcome-based indicators.

4.4 Factors which affect the achievement of quality forensic science

4.4.1 Regulatory schemes and practices

As described earlier, there are different quality standard programmes for achieving different purposes in forensic service provision. The methods of enforcing these programmes can also differ.

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[298] Nagarajan Karthiyayini and Chandrasekharan Rajendran, 'Critical Factors and Performance Indicators: Accreditation of Testing- and Calibration-Laboratories' [2017] Benchmarking: An International Journal <https://www.emerald.com/insight/content/doi/10.1108/BIJ-04-2016-0058/full/html> accessed 10 October 2019.

[299] Sutherland, Leatherman, and Health Foundation (Great Britain) (n 243).

[300] Jeroen Singels, Gwenny Ruël and Henny van de Water, 'ISO 9000 Series - Certification and Performance' [2001] International Journal of Quality & Reliability Management <https://www.emerald.com/insight/content/doi/10.1108/02656710110364477/full/html> accessed 7 October 2019.

As a result, Koppl and Krane[301] have suggested the need for the right mix of quality assurance programmes and enforcement strategies that complement each other, be it FSPs implementing some mechanisms proactively or through some external enforcement. Rankin and Thompson[302] argue that whether by voluntary, mandatory or by statute, the ethos of introducing quality standards must be to promote good practice for the organisations gaining accreditation. Thus, when it comes to achieving the purpose of regulation and accreditation, greater importance is attached to the attitude of FSPs, the organisational culture and individual work ethos of FSPs. Therefore, building regulation and accreditation into a compatible organisational culture is considered to be a good way of ensuring that errors will be reported and acted upon to invoke learning and to seek continuous improvement.

Others also argue that even though FSPs can implement quality assurance programmes voluntarily, regulation should provide external oversight to ensure that the quality assurance programmes and operations implemented by FSPs are not self-serving or so superficial to compromise the overall quality of services they provide.[303] Thus, regulation is expected to encourage a general interest in quality, and to constrain special interests of individual FSPs which may compromise the achievement of quality-related objectives. For this reason, Tontarski *et al*[304] suggest that forensic science regulators will be effective at mitigating the risk of quality failures if they have the legal authority and independence to receive, investigate and issue recommendations for complaints of laboratory failures. Yet, the success of the investigation will be dependent on the timely reporting of alleged failures and the ability of the regulators to implement and enforce recommendations. For investigative findings to be beneficial, it is also suggested that the regulators should focus on remedies rather than issuing penalties. However, the latter can be used on a case-by-case basis.

Jonakait[305] also believes in using regulation for remedial purposes, arguing that sanctions, such as forcing laboratories to close down will have a huge negative impact on the investigation of crime and the CJS. However, publicising the performance of laboratories, such as their proficiency test results, is considered to be an appropriate approach to both spur FSPs to improve and help advise

[301] Roger Koppl and Dan Krane, 'Minimizing and Leveraging Bias in Forensic Science', *Blinding as a Solution to Bias* (Academic Press 2016) <http://www.sciencedirect.com/science/article/pii/B9780128024607000103> accessed 16 October 2017.
[302] B Rankin and TJU Thompson, 'Accreditation: Regulation of Forensic Science' in Jason Payne-James and Roger W Byard (eds), *Encyclopedia of Forensic and Legal Medicine (Second Edition)* (Elsevier 2016) <http://www.sciencedirect.com/science/article/pii/B978012800034200001X> accessed 7 September 2018.
[303] Ryan M Goldstein, 'Improving Forensic Science Through State Oversight' (2011) 90 Texas Law Review 225.
[304] RE Tontarski Jr and others, 'Alternative Models Promote Self-Regulation of the Forensic Enterprise' (2012) 3 Forensic Science Policy & Management: An International Journal 139.
[305] Randolph N Jonakait, 'Forensic Science: The Need for Regulation' (1991) 4 Harvard Journal of Law & Technology 109.

the courts on who to admit in court. Comparing FSPs to clinical laboratories, forensic regulation that combines inspections, personnel standards, quality control, and external proficiency testing is considered to be a model that can improve endemic poor-quality performance in FSPs. However, it is cautioned that such a comprehensive regulation will be infeasible if it lacks the appropriate manpower, institutional superstructure and adequate funding to execute duties.

4.4.2 The cost-benefit consequences

The cost of FSPs adopting and implementing quality management systems and gaining accreditation has been a critical consideration when introducing quality assurance regulation in forensic science. A study[306] was conducted in the US to expose and predict any foreseeable changes that a Federal Crime Laboratory Reform Bill, which proposed a mandatory accreditation and monitoring for all crime labs could have on laboratories. Using open-ended survey questions, the study asked eleven crime laboratory managers in Texas State, who have been under mandatory accreditation requirements for eight years, to share their experience and perception of any changes they perceive of the Bill. The majority of participants supported the principle behind the Bill for uniform accreditation and quality management systems across the board of FSPs. However, the Bill was opposed because of its significant financial implications which could potentially collapse laboratories, especially small-scale laboratories who are under-funded. Secondly, the participants thought that the Bill will increase the cost of running laboratories with no positive impact on quality or turnaround time. Overall, these implications were thought to be overbearing and detrimental to the goal of good science.

For these cost-implications, Pierce and Cook[307] have reported that promising a high-quality forensic service provision for the CJS and the public is inseparable from the cost of time, planning, and adequate resources needed to implement the necessary quality assurance programmes and to effect the needed changes and improvements in quality. After a successful implementation of a blind proficiency testing programme at Houston Forensic Science Centre (HFSC), USA, the authors found that the time and resources involved in developing and sustaining the programme are not negligible and that most FSPs will find it even more challenging than they will initially anticipate.

Also, after successfully implementing blind proficiency testing programme at the Harris County Institute of Forensic Sciences, Texas, USA, following the recommendations by the 2009 NAS

[306] Hueske and Wayland (n 286).
[307] Pierce and Cook (n 79).

report, Hundl *et al*.[308] reported that the most significant factors for a successful implementation of blind quality control programmes are: 1) the positive relationships and collaborations with stakeholders; 2) dynamic analyst engagement; 3) a gradual implementation rate, and 4) the ability of blind quality control samples to effectively mimic casework—this was the greatest challenge, according to the authors.

Due to these challenges, others also argue that where there is an absence of or doubts about a clear benefit of a third-party accreditation, in terms of helping FSPs to achieve some operational objectives and promote continuous improvement, then FSPs should consider implementing quality management systems without seeking third-party accreditation.[309] However, such advice may be unpopular given that a third-party accreditation is expected to check that FSPs do not implement quality management systems in a self-serving or in a superficial manner to compromise the quality of their work. Thus, the lack of third-party organisation to monitor and scrutinise laboratories quality management systems may be potentially risky to the quality of forensic science. As a result, the financial cost of implementing quality assurance programmes should be weighed against other costs in terms of the errors, failures and potential miscarriages of justice, which can be caused by the lack of appropriate QMS by FSPs.[310]

4.4.3 Some external factors

Aside from laboratories' internal practices and external regulation, concerns have been expressed about non-regulatory factors which can affect the achievement of quality improvement outcomes in forensic service provision. Laurin[311] has demonstrated that the upstream usage of forensic science can undermine the reliability and quality-improvement goals of quality assurance regulators. This includes how police and prosecutors select priorities, initiate investigations, collect and submit evidence, choose investigative techniques, and charge and plead cases. Consequently, it is posited that forensic science regulatory models that are based on setting quality standards and/or accrediting laboratory practices but exclude the upstream dynamics, including forensic procurement, embodies a very narrow conception of forensic science regulation.

[308] Hundl and others (n 80).
[309] Lauren Elizabeth Wilson and others, 'Fit for Purpose Quality Management System for Military Forensic Exploitation' (2018) 284 Forensic Science International 136.
[310] Rankin and Thompson (n 302).
[311] Jennifer E Laurin, 'Remapping the Path Forward: Toward a Systemic View of Forensic Science Reform and Oversight' (2013) 91 Texas Law Review 1051.

This has been contextualized in the UK-setting by McAndrew[312] who argues that, in the context of commercialisation, the quality of forensic science is not necessarily dependent on the availability of quality assurance regulation. Instead, a stronger emphasis is placed on police spending on forensic science and the corresponding reaction to this by private FSPs. This argument has been reiterated by Becker,[313] that even with quality assurance regulation in place, ultimately the quality of forensic science is influenced by the financial pressures faced by FSPs. Lawless[314] has found that commercialisation and serious budget considerations have given forensic science in England and Wales a new meaning, where police forces have the greater control to determine the role of science in investigative work; the kind of evidence that will be recovered from the crime scene and subsequently produced; the kind of procedures that will be deployed for analyses; and who interprets the evidence. It is argued that this risks the fitness for purpose of forensic science in the CJS.

Before the introduction of the FSR role, Roberts[315] explored the potential tension between a free-market competition of forensic service provision and an external quality assurance regulation, as was recommended by the Runciman Royal Commission in 1993. Even though the proposal for external quality assurance regulation was supported, effective regulation was envisaged as incompatible with a free market service provision. Without long-term investment, direction, and support from the government, it was anticipated that direct charging for forensic services would be counter-productive to continued research and development, which are required to support and improve the quality of forensic science services.

One of the consequences of financial pressures in forensic science service provision may be the tendency for FSPs to take cost-saving decisions in an attempt to maintain or increase return on investment. This has been extensively discussed in a series of performance measurement studies.[316] One of the cost-saving strategies is for FSPs to reduce some analytical costs, by minimising multiple analytical testing on a given sample. However, this has been demonstrated to be

[312] William P McAndrew, 'Is Privatization Inevitable for Forensic Science Laboratories?' (2012) 3 Forensic Science Policy & Management: An International Journal 42.
[313] Wendy S Becker, W Mark Dale and Edward J Pavur Jr, 'Forensic Science in Transition: Critical Leadership Challenges' (2010) 1 Forensic Science Policy & Management: An International Journal 214.
[314] Christopher Lawless, 'Policing Markets: The Contested Shaping of Neo-Liberal Forensic Science' (2011) 51 The British Journal of Criminology 671.
[315] Roberts, 'What Price a Free Market in Forensic Science Services - The Organization and Regulation of Science in the Criminal Process' (n 5).
[316] Paul J Speaker, 'Key Performance Indicators and Managerial Analysis for Forensic Laboratories' (2009) 1 Forensic Science Policy & Management: An International Journal 32.

detrimental to the quality of forensic science. This has been observed in one study which showed how the quality of post-mortem analysis was diminished by cost-savings on analytical tests.[317]

As was described in the previous chapter, some practices in England and Wales, such as SFR have been intentionally introduced for 'cost-effective' purposes in forensic service provision. In addition to the adverse implications of SFR that were captured in the FSR report, other experts have also criticised the impact of SFR.[318] Edmond *et al*.[319] have questioned the benefits of SFR, including the claims that it avoids the cost of a long form of forensic reports; facilitates an agreement between the parties; secures more guilty pleas, and reduce the number of defence challenges to forensic science evidence. Rather it has been observed through document reviews that the SFR directs little attention to the presentation of forensic science evidence and the quality of forensic science evidence (validity and scientific reliability). In so doing, it is found that the SFR introduces new risks of misrepresentation, misunderstanding and mistakes in forensic science. Thus, adding on to the findings of the document analysis chapter, the literature also provides instances of financial priorities interfering with the pursuance of quality forensic service provision, even with the FSR in place.

4.5 Conclusion of literature review

4.5.1 Theoretical perspective

Across both literature on the provision of services in general and forensic science services specifically, the review has found commonalities in the theories underpinning regulatory effectiveness and the methodologies for assessing the impact of regulation on the quality and quality improvement of services. Theoretically, evaluation of regulatory effectiveness should ensure that neither the selected benchmark nor the indicators for assessing effectiveness are too low to risk judging the regulation artificially effective, or too high to risk judging it unnecessarily ineffective. Thus, in the forensic setting, the mere monitoring of an increasing or decreasing the number of accredited FSPs, or the impact of forensic science evidence on courtroom outcomes alone may not be relevant, first, as a measure of quality or quality improvement, and, second, as the benchmark for measuring the respective impact of regulation or quality standard programmes. Rather, there is enough evidence that using some features based on the entire process of forensic

[317] Henry J Carson and others, 'Shortcomings of Urine-Preferred Drug Screening on Post-Mortem Specimens' (2011) 2 Forensic Science Policy & Management: An International Journal 158.
[318] Karen Richmond, 'Streamlined Forensic Reporting: "Swift and Sure Justice"?' (2018) 82 The Journal of Criminal Law 156; Carole McCartney, 'Streamlined Forensic Reporting: Rhetoric and Reality' (2019) 1 Forensic Science International: Synergy 83.
[319] Gary Edmond, Sophie Carr and Emma Piasecki, 'Science Friction: Streamlined Forensic Reporting, Reliability and Justice' (2018) 38 Oxford Journal of Legal Studies 764.

service provision, from the crime scene to court, can set the relevant threshold for assessing the impact of regulation and quality standard programmes on the quality of forensic services provided by FSPs.

To approach this, there has also been evidence that the impact of non-regulatory and economic factors on the quality of forensic service provision must be considered. This is particularly persuasive for this study, given that other agencies and structures attempt to deliver other aspects of quality forensic service provision alongside the FSR role. Monitoring the impact of these factors on the quality of forensic science should determine how the achievement or non-achievement of quality-related objectives is related to the FSR's specific quality assurance and improvement programmes. This means that any assessment of regulatory effectiveness that neglects the impact of economic factors on the quality of forensic science or treats those impact separable from the impact of the FSR role could miss the estimation of the effectiveness of the FSR role. This also applies to the estimation of the effectiveness of any reforms aimed at improving the effectiveness of regulation. Thus, the literature review confirms the significance of the gap in knowledge concerning both the lack of knowledge about the impact of the FSR programme of work on the quality of forensic service provision and the perceived effectiveness of the proposed statutory powers for the FSR role.

4.5.2 Methodological perspective

The review has captured the importance of ascertaining the experience and views of service providers to understand the impact of regulation and quality assurance programmes. Both quantitative and qualitative approaches were highlighted; the latter seems more popular in the forensic setting, including the use of semi-structured interviews, surveys and casework reviews as data collection methods. The review, therefore, indicates that FSPs are best placed at pinpointing any changes and/or improvement in their practice that can be attributed to external regulatory requirement and guidelines or any other external non-regulatory factors. Because different quality assurance programmes are mostly adopted or implemented for different specific purposes by FSPs, evaluation of the impact of these programmes can achieve two goals: firstly, whether the specific purposes for implementing these quality standards programme have been achieved, and, secondly, whether this outcome reflects the overriding purpose of the regulator.

The review indicated that the majority of the studies which had looked into the impact of specific quality standards programmes on the quality of forensic service provision are non-UK based, indicating a gap in the literature from the UK perspective. The significance of this gap also points to the lack of understanding of the impact of the FSR programme of work, that is, whether they are

helping the work of individual FSPs to meet the requirements of the CJS concerning the delivery of forensic services. Thus, identifying some changes and/or improvement in the forensic science provision process of different FSPs that can be attributed to the FSR role is a valuable contribution to knowledge. This study addressed this gap in knowledge and literature through the conceptual framework below. The framework emulates the studies which explore the experiences and views of individual FSPs concerning the impact of quality assurance programmes on their work.

4.5.3 Conceptual framework of this study

Conceptual framework or perspective is a structure for organising and supporting the ideas that provide the territory of a proposed study.[320] Based on the insights which were gathered from the literature concerning the multiple theoretical and methodological perspectives for assessing the effectiveness of regulation, the understanding was that the effectiveness of the FSR role is complicated to gauge and demonstrate. This is because the quality of forensic services provided by FSPs may be driven by the actions and the programmes of the FSR role, the inherent activities of FSPs and the impact of other external factors. This means that assessing whether the FSR role is fit to improve the quality of forensic service provision cannot be gauged by examination simply of the actions of the Regulator alone. Rather, the fitness for purpose of the FSR role should be based on the extent to which the appointed Regulator can develop programmes to fulfil the role of the FSR, and the extent to which these programmes, alone or in conjunction with other agencies, help and enhance FSPs to provide forensic services that meet the requirements of the CJS. This formed the conceptual framework of the study, as shown in Figure 4.2 below, and also underpinned the research questions.

[320] Vernon Trafford and Shosh Leshem, *Stepping Stones to Achieving Your Doctorate* (Open University Press McGraw-Hill Education 2008), p.84.

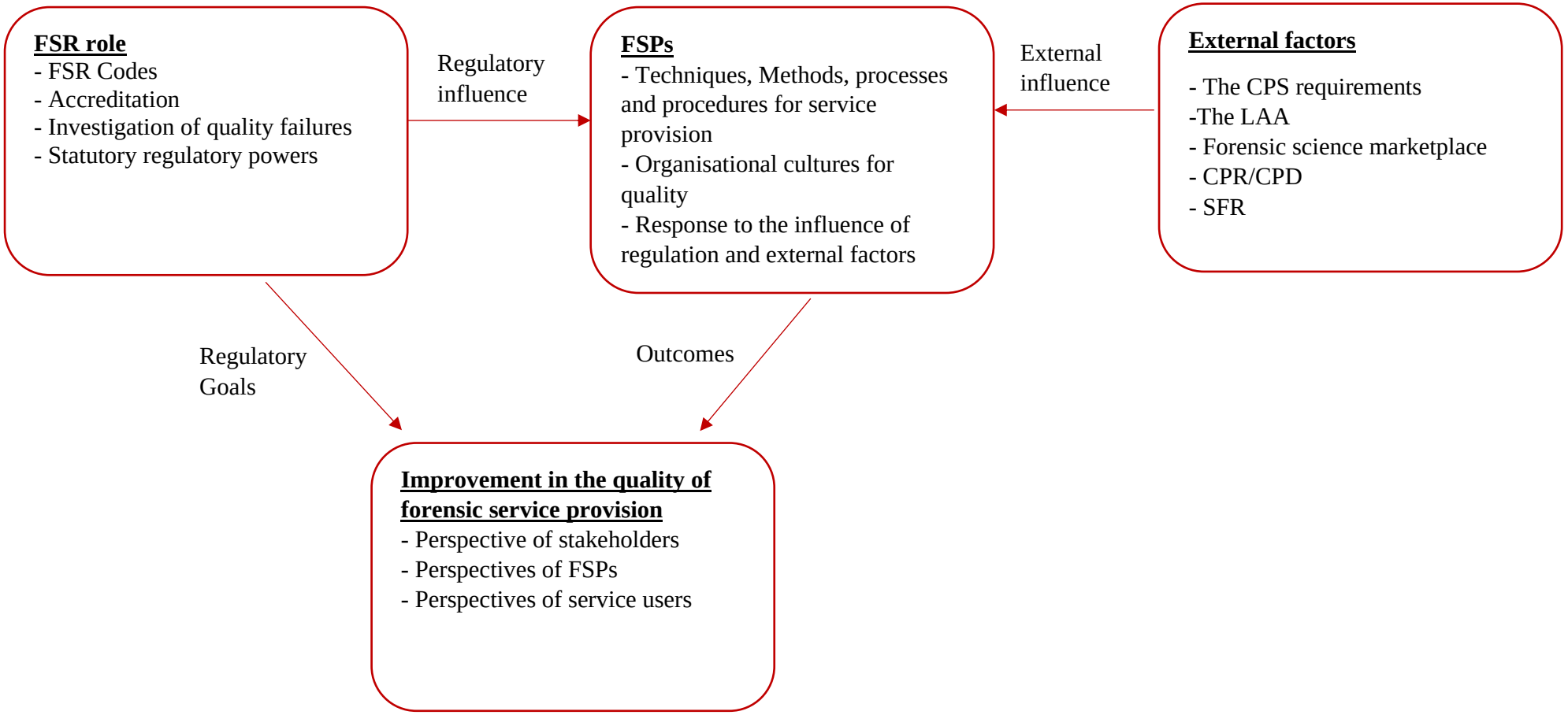

Figure 4.2. A Conceptual framework for assessing the effectiveness of the FSR role.

For the first research question, the understanding was that before assessing the impact of the FSR role on the quality of forensic service provision, the design of the FSR role, in terms of the organisational structure should be explored, since this is the framework from which all decision-making concerning the quality of forensic sciences are made. Therefore, gaining an understanding of the structural and contextual factors which impact upon the FSR role and affect the operation of the Regulator should help determine the extent at which the Regulator is successful at developing or implementing programmes to effect quality and quality improvement goals. The document analysis indicated that relying on a single source of data (stakeholders' reports) alone may have some potential biases in understanding how different factors interact to affect the performance of the Regulator. Given the close interactions between FSPs and the FSR, it was perceived that the general experiences and perceptions of FSPs about the strength and weaknesses of the FSR role should provide valid evidence to supplement the findings of the document analysis chapter.

After ascertaining these factors, the impact of the FSR role on the quality of forensic services can then be probed. The second research question was, therefore, based on the gap in knowledge about the impact of the FSR Codes on the quality of forensic science. To address this gap, the focus was to identify some relevant indicators which can satisfy the definition of quality forensic science and can determine the respective impact of the Regulator's quality standard programmes. Given the flexibility and subjective preferences associated with this process, the requirements of the CJS concerning the delivery of forensic service by all FSPs were used to conceptualise the quality of forensic service provision. These are re-captured in Table 4.2 below.

Table 4.2. The CJS' requirement for forensic service delivery, information available from the FSR's first Business plan.[321]

Is the FSR role effective in supporting/enhancing FSPs achieve the following?
1. The delivery of forensic science services, using the appropriate available scientific techniques, according to the highest professional standards;
2. With efficiency, integrity, impartiality and accuracy at every stage throughout the process;
3. At a cost which represents best value for money, within timescales which meet operational needs;
4. Reflecting an understanding of the needs of the specific customer and the requirements of the CJS as a whole, thereby;
5. Maintaining and enhancing public confidence in the quality and reliability of forensic science in the CJS.

[321] Rennison, 'The Forensic Science Regulator Business Plan 2008/09 - 2010/11' (n 7), p.1.

From the table above, public confidence in the quality and reliability of forensic science can be the ultimate outcome-based criterion to assess whether the process of forensic science services meets the needs of the CJS. However, it was envisaged that based on the competing debates which were captured in the literature, public or service-users' opinions will be irrelevant in understanding whether forensic services provision by FSPs does meet the benchmarks of quality and, especially, the respective impact of the FSR role. Experience shows that the value/quality of forensic science will depend upon the purpose for which it is used, and this may vary at the time of the forensic service delivery, such as during preliminary inquiries, an investigation, or in preparation for trial, or at trial as well as who the 'customer' is—that is defence, police, prosecution, and the judiciary. The diversity of forensic science and its use throughout the criminal investigation process almost entirely precludes the ability to point to 'good quality' forensic science, not least by its 'customers' or solely within the court. Such information will be, generally, poorly informed and will be influenced by unidentifiable and unrelated variables.

However, it can be understood from Table 4.2 that monitoring the first four requirements should help understand whether forensic services from the crime scene to court have been delivered appropriately or are methodologically robust to secure the ultimate confidence of forensic service users in the quality and reliability of the final forensic evidence. These indicators, therefore, satisfied the definition of quality forensic science, from the perspective of the needs of the CJS. A critical evaluation of these indicators also shows some relationship with the FSR role and its quality standard requirements for FSPs. The relationship is that the Regulator's programme of work—that is, quality standards, accreditation and investigation of quality failures, should support and enhance the work of FSPs to meet the individual requirements of the CJS. As a result, with the exception of decisions about the best value for money, the FSR Codes cover the requirements in the table above, including the requirement for FSPs to, prior to commencing any casework, identify the issue(s) in the case, develop an appropriate examination strategy and agree on the timescale for the delivery of the results, in consultation with the customer.[322]

Monitoring the changes in practice across FSPs as a result of the Regulator's programme of work and whether these changes are in line with the first four requirements satisfied the relevant criteria for assessing the impact of the FSR role on the quality of forensic service provision. This is the first time a study is being conducted using these features as the criteria for quality of forensic service provision and to ascertain the effectiveness of the FSR role. However, because other structures and processes, such as the SFR and the forensic marketplace aim to deliver some of these

[322] The Forensic Science Regulator, *Codes of Practice and Conduct* (2020), p.58.

requirements, at least the cost and timelines of forensic service delivery, it was necessary to explore the impact of these factors on the work of FSPs as well.

Overall, because these first four requirements are expected of FSPs, individual FSPs are best placed to pinpoint how the FSR role and external factors have impacted upon their ability to meet them. The views of FSPs should throw light on the strengths and weaknesses of the regulator's programme of work which are intended to improve the quality of forensic service provision, and whether reforms may be needed to improve regulatory effectiveness. The latter informed both the third and fourth research questions. The view was that, because individual FSPs are the target of statutory regulation, their experiences and views should provide evidence to corroborate or contest any perceived goal of the FSR Bill. Most importantly, this should help expose any foreseeable changes that the FSR Bill could bring, so that any potential issues within the Bill can be addressed before its legislation rather than react after its legislation. Further, other recommendations of FSPs may be crucial, in terms of identifying issues about the FSR role that needs changing or improvement to enhance the FSR framework and regulatory effectiveness.

Chapter 5. Methodology for fieldwork

This chapter begins by explaining the rationale for the research design which informed the design of the fieldwork. The purpose of the fieldwork was to gather data to answer the research questions and to corroborate, contend and/or clarify the findings of the document analysis. The qualitative research approach was the most appropriate strategy to answer the research questions and achieve the aim of this study. This was informed by the interpretive framework chosen for this study. The interpretive framework was that multiple and subjective experiences and views of different FSPs are required to understand the fit for purpose of the FSR role. Subsequent decisions regarding the data collection methods, sampling procedures and data analysis techniques were guided by this epistemological position and inspired by the phenomenological approach of qualitative studies. Using this approach, the importance of an interpretive framework or paradigms in qualitative research was acknowledged.

5.1 Rationale for research design: interpretive perspective

An interpretive framework is described as a paradigm or the worldviews which help to enact the philosophies—that is, the abstract beliefs and ideas—that underpin a research process.[323] The development of the interpretive framework for this study begun by recalling the conceptual framework which was developed for the appraisal of the fitness of the FSR role.[324] The conceptual framework established that it was most appropriate to explore the impact of the FSR role on the quality of forensic science by enquiring the experiences and views of FSPs concerning changes in their practice that can be attributed to the FSR role, especially, how regulation helps them to deliver services that meet the requirements of the CJS. However, there were other factors which had to be taken into consideration to determine the appropriate method for the data collection, sampling procedures and data analysis techniques.

Firstly, a broader definition was noted of the target FSPs, with some associated diversities which could influence diverse experiences and views of participants about the FSR role and the research questions. It was observed that FSPs are defined by the Regulator as comprising individual forensic practitioners, academics, public or private sector forensic science providers, small teams in larger organisations, sole practitioners or large providers, working for the police, or instructed by the prosecution or defence.[325] Within this broad definition, there were compelling differences,

[323] John W Creswell and Cheryl N Poth, *Qualitative Inquiry & Research Design: Choosing Among Five Approaches*, vol 11 (4th edn, SAGE Publications, Inc 2018), pp.16-22.
[324] Avedis Donabedian, 'Evaluating the Quality of Medical Care' (2005) 83; The Milbank Quarterly 691.
[325] Forensic Science Regulator, *The Codes of Practice and Conduct-Issue 4* (n 143), p.13.

including the disparate forensic science services that each FSP supply to the CJS, and hence their different interactions with regulatory requirements, such as the scope of accreditation, and the marketplace with forensic science 'customers'. Thus, both subjective and objective experiences within and across different FSPs were envisaged. Therefore, to understand the fitness of the FSR role through the lens of individual FSPs, it was appropriate to ascertain multiple experiences and perspectives of participants from across different groups and individual FSPs.

Secondly, considering the classification of FSPs based on the size or the scope of forensic science services they provide (small-scale, large-scale or sole-traded providers), it was anticipated that this could result in varied and subjective interactions between individuals and a group of FSPs and regulatory requirements. This is because, even though the FSR Codes and it's quality standard requirements apply to all FSPs, the implementation of the relevant requirements in the Codes, such as during accreditation, will correspond to the scope of forensic science service/activities of individual FSPs or a group, such as those who provide the same forensic service. This is known as the scope of accreditation. From this, different FSPs of the same or different sizes or the same or different scope of services/activities could have different experiences and views about the FSR role, such as the impact of regulatory requirements on the costs of running their practice. These experiences and views across multiple FSPs could be analysed for differences and commonalities.

Finally, when considering the classification of FSPs based on sector, it was acknowledged that even though this had no significance in terms of how FSPs interact with the FSR role, it had significance in terms of how FSPs interact with the marketplace. Thus, police forces and private FSPs would interact differently with the forensic marketplace and its consequences, as was indicated in the document analysis. Even among private FSPs, further variations existed between different sized FSPs. These included the 'bargain basement' prices levied for some services, uncertainty in service supply and other contractual defects which may vary from different-sized private FSPs. As a result, it was anticipated that the asymmetric interactions between individual FSPs and the forensic marketplace could yield different and multiple experiences within FSPs about the impact of the forensic marketplace and fitness of the FSR role to be in charge of the quality of forensic science. All the above explanations were, also, closely related to how individual FSPs may view the FSR Bill as a necessary and significant reform, in terms of the changes it could bring to the regulation and the quality of forensic service provision. Further, different FSPs may also have different opinions for recommendations for relevant reforms for the FSR role.

These observations and assumptions suggested that the appropriate design to understand the fit-for-purpose of the FSR role was to rely on multiple subjective experiences and views of FSPs, by

using a data collection strategy that ensures a close interaction with the study participants. This was the epistemological position of this study. Epistemology is defined as the process of acquiring knowledge.[326] Thus, the design of the study was based on the view that since different FSPs may have different interactions with the FSR role and the dynamics of the forensic science sector, this will translate into both subjective and objective experiences which can be explored to identify the insights of regulatory effectiveness where there has been a limited knowledge. Drawing the common meaning of regulatory fitness would, therefore, incorporate both the similarities and differences of the experiences and views of FSPs.

5.2 Considerations for research design

From the above assumptions, it was necessary to utilise a research design with a data collection strategy that ensures close proximity with participants to explore both explicit and implicit meaning that individual FSPs attach to FSR role and its impact; and allows the flexibility to explore multiple and diverse experiences and views of participants. Also, a research design with a data analysis strategy that helps to (co)-interpret and understand a common meaning of the fitness of the FSR role from the multiple and diverse experiences and views of participants was necessary. Further, it was essential to adopt a research design that could address the four research questions.

5.2.1 Research design: Phenomenology

From these considerations and epistemological standpoint, the phenomenological research approach was appropriate to achieve the objectives of this study. Phenomenology is a qualitative research approach used to describe a common meaning of the experience of individuals who have experienced a particular concept or phenomenon.[327] It works by ascertaining multiple experiences of individuals and reducing these into a composite meaning of experience that may be representative of all the individuals who have experienced the phenomenon. The two types of phenomenology are descriptive and interpretive/hermeneutic approaches.[328] The descriptive approach focuses on describing the individuals' experiences about the phenomenon, while the interpretive/hermeneutic approach focuses on gaining a deeper understanding of the essence of that experience, such as how the lives of individuals may have been affected by the phenomenon. Even though their end goal differs, both types of phenomenology share some common procedures. These comprise a common initial enquiry of the phenomenon under study; bracketing out researcher's

[326] Creswell and Poth (n 323), p.21.
[327] Creswell and Poth (n 323), p.75.
[328] Gerald Amandu Matua and Dirk Mostert Van Der Wal, 'Differentiating between Descriptive and Interpretive Phenomenological Research Approaches' (2015) 22 Nurse Researcher <https://doi.org/10.7748/nr.22.6.22.e1344> accessed 27 September 2018.

personal view about the phenomenon; collecting data of individuals' experience; and analysing the data to generate composite themes of experiences. However, the hermeneutic approach concludes by interpreting or co-interpreting some implications related to these experiences.[329] Also, while the descriptive approach is used to illuminate poorly understood aspects of experiences of individuals, the interpretive/hermeneutic approach helps to examine contextual features of experiences in relation to other influences on the people or groups experiencing the phenomenon.[330]

With its root in the field of psychology, phenomenology has evolved within different disciplines and is more broadly used in studies that emphasise 'first-person' experiences.[331] A key aspect of phenomenology is the idea of 'intentionality of consciousness'. This idea emphasises that individuals who have experienced a phenomenon do direct some conscious experiences towards that phenomenon. Therefore, where multiple individuals have experienced a common phenomenon, their experiences will be intrinsically relational, in that their activities and behaviours will be shaped by the phenomenon. Gathering these multiple experiences, thus, helps to understand how a certain phenomenon impacts upon the activities and the behaviour of individuals. It also suggests that the individuals who have experienced a certain phenomenon will be able to share their intimate responses about the phenomenon than those who have not experienced it.

With regards to the aim of this study, and given the context in which FSPs operate and their activities influenced through both the FSR role and the conditions of the forensic marketplace, the interpretive/hermeneutic approach was used to understand 'what' the impact of the FSR role on the practice of FSPs has been; and 'how' this impact has occurred. The procedures of the phenomenological approach were delineated in this study, first, through the document analysis, which provided initial data about the role of the FSR, its impact on the quality of forensic science and the challenges facing the FSR role. Secondly, the conduct of the fieldwork was intentionally approached,[332] by using a purposeful sampling procedure to recruit participants from across the forensic science community and a semi-structured interview procedure to allow the participants to share their experiences in their own way. The data analysis was also approached using the thematic analysis procedure to identify the recurrent themes in the experiences and views of FSPs. The rationale for choosing these procedures, including some limitations, are explained in the next sections.

[329] Creswell and Poth (n 323), pp.78-80.
[330] Matua and Wal (n 328).
[331] Frederick J Wertz and others, *Five Ways of Doing Qualitative Analysis: Phenomenological Psychology, Grounded Theory, Discourse Analysis, Narrative Research, and Intuitive Inquiry.* (2011), pp.125-136
[332] Creswell and Poth (n 323), p.164.

5.2.2 Qualitative method

For all the research questions, asking FSPs to share their experiences and views about the FSR role through open-ended questions was more appropriate to infer some tangible conclusions about the fitness for purpose of the FSR role. The process of using examples and observations that people hold about a certain phenomenon to draw certain patterns, make sense of or infer a conclusion about the phenomenon is a qualitative approach.[333] The robustness of a qualitative design to address all the research questions was demonstrated in the literature review, such as through the use of interviews, open-ended survey questions and casework review.

For the first research question, it emerged that qualitative interviews could be used to gather the general experiences and views of FSPs about the strengths and weakness of the FSR role. For the second research question, it was anticipated that as each component of the FSR role, such as accreditation, is intended to achieve specific goals, the FSR role may provoke some changes and improvement in the work of FSPs that using pre-determined indicators alone may be unable to capture. Therefore, the advantage of a qualitative approach was that it could, firstly, capture whether the intended goals of the specific components of the FSR role are being achieved, and, secondly, how these goals relate to the requirements of forensic service provision demanded of FSPs by the CJS. By this, a qualitative approach was far-reaching in assessing the effectiveness of the FSR role, in terms of determining how the component programmes of the FSR role are impacting the work of FSPs to achieve the overriding purpose of regulation.

Also, for the impact of non-regulatory external factors, it was appropriate to ask FSPs to share experiences and views from their individual practice and in relation to the wider community of FSPs. This approach was more relevant to compare the FSR role and other external factors, in terms of their individual and collaborative impact, both positive and negative, on the work of FSPs. For the third and the final research questions, a qualitative approach was also more relevant to ascertain the changes FSPs perceive of the FSR Bill, as well as any measures that FSPs think would work best on the ground to improve the quality of the forensic services they provide. As a result, qualitative interviews were more robust and flexible, and hence, appropriate to answer the four research questions.

Specifically, semi-structured interviews were used. This type of interviews signifies the use of open-ended questions where participants can answer the research questions in their own way. They are useful for gaining a deeper meaning to participants' understanding of issues and to explore new

[333] Creswell and Poth (n 323), p.7.

areas where there is limited knowledge in literature.[334] This has the advantage over closed-ended interviews or quantitative questionnaires which implore fixed and limited choices of answers from the participants.

Besides qualitative interviews, another qualitative approach which could have been used was the observational study design, such as reviewing the casework records of FSPs for changes in their forensic practice and how the FSR role has made some impact. However, this was only selective for the second research question. Secondly, a casework review was anticipated to be problematic in terms of getting access to the case records of FSPs. Even if they were to be accessible, such a study could be laborious, in terms of the time to review these case records. As a result, such an approach was appropriate for a case study or a comparative study for a limited number of FSPs. This was incompatible with this study's focus to ascertain multiple experiences and views about the fitness of the FSR role.

5.2.3 Quantitative method

It emerged from the literature review, particularly, the ISO-based studies, that a quantitative approach can be used to determine the impact of quality assurance programmes on the quality of services. The purpose of a quantitative approach is to establish a direct causal relationship between the quality assurance programmes and some changes or improvement in some pre-determined indicators or features of the quality of service. As a result, a quantitative approach for this study would have required developing some pre-determined indicators based on all the research questions. For the first research question, using the specific roles of the FSR, a quantitative instrument could have been developed to ascertain the number of FSPs who think the successive Regulators have been able to fulfil those specific roles. However, without supplementing these with some qualitative responses, this approach alone was weak in its ability to ascertain the strength and weaknesses of the FSR role and the factors which impact on regulatory performance.

Also, for the second research question, the requirements of forensic service provision demanded of all FSPs by the CJS could have been used as predetermined indicators to ascertain some percentage of FSPs who think the FSR programme of work has impacted their work to meet these requirements or otherwise. However, establishing a direct causal relationship between the FSR programme of work and the achievement of these requirements by FSPs would be difficult, if impossible, because of the influence of external factors which impact on the target indicators as well. Also, given the multiple components of the FSR programme of work, it was envisaged that a quantitative approach

[334] Alan Bryman, *Social Research Methods* (5th edn, Oxford: Oxford University Press 2016), p.244.

may be difficult to determine which component of regulation may be responsible for improvement or changes, because multiple programmes may have some same or different effects on some of the target indicators of quality. Thus, ascertaining the strength and weaknesses of the regulator's programme of work would not be feasible with only a quantitative measure of effectiveness. For the third and the final research questions, open-ended questions were most appropriate to determine the views of FSPs. Thus, overall, without some qualitative responses, the four research questions could not be fully answered.

5.3 Consideration of ethical procedures

Given the focus of this study to gather data from FSPs, the data collection and the subsequent analysis had to be guided by all necessary ethical procedures. The risk level of this study was medium, as it was assessed that the data to be collected from individual FSPs may have some implications on their practice. There was the need, therefore, to be guided by ethical procedures, even for the document analysis where all the reports that were analysed were accessible to the public. The ethical consideration for this study was the requirement to ensure the anonymity of the participants and the data. The proposal for the ethical conduct of the study was submitted to the Northumbria University's Faculty of Business and Law Research Ethics Committee for approval.

The proposal included the information which clarified the arrangements to assure the participants that their participation was voluntary; that their privacy would be protected; and that they retained the right to withdraw their participation at any time. The proposal also included informing the participants about: a) the aim of the study and the research questions; b) the sampling criteria and strategy; c) obtaining their informed consent, including consent to be interviewed and to be recorded; and d) the storage and use of data in publications and how confidentiality/anonymity of data and participants will be ensured. These proposals followed the standard procedures of the Research Ethics Committee and received an expedited review and approval (Appendix I).

Some ethical concerns arose during the interview stage. Citing the forensic science sector as a very small sector, some participants reiterated the likelihood for people to be identified with certain views and the need for strict anonymity. As a result, they were reassured that their privacy would be protected by strict confidentiality, including the exclusion of any personally identifiable information from the data and in any publication. The identities of all the participants were masked with code names during the interview, transcription and data analysis process. Also, some precautionary measures were taken to ensure the participants' confidentiality, including the use of lone and quiet rooms for all the interviews. Further, two tape recorders were used for the interviews;

one was used as a backup to respond to the possibility of unforeseen circumstances, such as any abrupt termination of the recording. All the recorded interviews were stored and processed on a password-protected computer. Finally, other documents related to the data and participants were kept in a locked filing cabinet.

5.4 Limitations of the study design

Although this study had, in principle, some fundamental similarities with a phenomenological study design, in terms of the goals of data collection, data analysis and data interpretation of a common meaning of regulatory fitness, some limitations were observed. Firstly, given that phenomenology emphasises personal experiences and intentionality of consciousness, its data collection utilises individuals as research participants.[335] However, this study differed in terms of the target participants which comprised both individual FSPs (sole-traded FSPs and independent practitioners) and forensic science organisations. Therefore, treating forensic science organisations as single entities was a limitation. This is because, within the same organisations, different people depending on their role may have different levels of knowledge and understanding of the role of the FSR and its impact on the activities of the organisation. Therefore, in dealing with forensic science organisations, it was only possible as a proxy method to identify a participant from each organisation whose role permits them to have some significant knowledge and understanding of the work of the FSR and its impact on the work of the organisation.

These individuals were identified as the quality assurance managers or directors of the organisation whose role include overseeing the adoption and implementation of the Regulator's quality standards and accreditation requirements within the organisation. It was considered that these individuals may have more in-depth experiences, views, and opinions about the impact of regulatory requirements on the operational activities of the organisation than the regular forensic scientist in the organisation who only performs certain tasks within their area of expertise. Therefore, the experiences and views of the quality assurance managers and directors of forensic organisations were considered to be, with some bias, an acceptable representation of the experience of the organisation. Recognising this, the recruitment of the study participants was intentionally approached using the purposeful sampling procedure.

[335] Wertz and others (n 331), pp.125.

5.5 Recruitment of participants

The fieldwork data collection commenced after all ethical permissions were gained. By taking the phenomenological approach, a target number of 10 and 25 participants was set. This was based on the recommendation from the literature, which suggests five to 25 interviews, with as many as 10 interviews considered appropriate to describe a composite experience about a phenomenon.[336] The initial consideration for sampling was to identify all 'individuals who have experienced' the FSR role. This was a broad definition comprising people who are familiar with the operations of the FSR and/or have had direct or indirect interactions with the FSR role. By this, the sampling pool encompassed members from the Regulator's FSAC and Specialist Groups, individual FSPs, and a wide range of professional representative bodies who interact with the FSR role through affiliations and/or partnerships. The representative bodies included forensic science practitioners' and providers' associations, such as the CSFS and the Association of Forensic Science Providers (AFSP).[337]

However, from the wide pool of potential participants, FSPs (individuals and organisations) were considered the key participants who may have some experiences typically constructed from direct interactions with the FSR role. As a result, their experiences and views were more relevant in answering the research questions and to draw tangible conclusions about the fitness of the FSR role. Essentially, the broad classification of FSPs used in the FSR Codes was adapted as the sample frame. Given this defined framework of potential participants, the purposeful sampling strategy was the appropriate procedure to recruit the participants. Purposeful sampling is a sampling procedure where individuals and sites are selected for study because they are relevant to the research question or can purposefully inform an understanding of the research questions and the central phenomenon under study.[338] As a result, participation in this study was narrowed down to individuals and representatives from FSPs who could answer the research questions. Also, given the different classification of FSPs, the emphasis for sampling was to obtain participants from each of the classifications of FSPs to obtain different and multiple experiences and perspectives.

Two types of purposeful sampling were used. Firstly, the 'criterion' approach to purposeful sampling was used to identify FSPs according to accreditation status. This is because, among the different classification of FSPs, accreditation was a common characteristic to all, irrespective of size or sector. This criterion helped to narrow down FSPs to the level of accreditation. A reliable

[336] Creswell and Poth (n 323), pp.157–161.
[337] 'Association of Forensic Science Providers' <http://www.afsp.org.uk/> accessed 30 July 2020.
[338] Bryman (n 334); Creswell and Poth (n 323), p.158.

source of contacts which was used to identify potential participants was UKAS' website, which maintains a directory of all FSPs who are accredited to provide different forensic science services.[339] The details of the accredited FSPs on UKAS' website consisted of different sized organisations, including private, academic, police forces and some public sector FSPs. For each accredited FSP, the details of accreditation included the contact details, including a corresponding email address, telephone number and facility location. Also included were the details of the scope of forensic science activities/services of each FSP and the standards to which these activities/services were accredited, either to the ISO 17025, the FSR Codes of Practice and Conduct or both. With these details, a database was created to recruit potential FSPs.

However, prior evidence from the document analysis indicated that sampling by accreditation alone could be biased. The document analysis had highlighted that there was still an unknown number of FSPs who supply services to the CJS without having achieved accreditation for all or some of their forensic science activities. Non-accreditation meant that the activities/services of the suppliers were not officially accredited by UKAS to the relevant standards in the ISO 17025, ISO 17020 or the FSR Codes. These were mostly small-scale FSPs and sole practitioners who provide specialised forensic services, including services for the defence. It was anticipated that although these FSPs may not be accredited, their experiences about the FSR role and its impact were still valid and relevant to the research questions. For instance, their experiences and views on accreditation and its impact on their service-provision can be insightful about the consequences of the FSR role, including the demand for statutory powers for the Regulator. As a result, the sample framework was expanded beyond the level of accreditation to include non-accredited FSPs.

Identifying these potential participants (from the category of non-accreditation) was done in a contingent approach throughout the data collection process. Initially, a supplementary source of contacts was gathered from the list of individuals who have previously responded to forensic science enquiries and consultations by the FSR, the House of Commons, and the House of Lords' Science and Technology Committees. From the document analysis, it emerged that the reports of these Committees were supplemented by the list of respondents who made contributions or submissions. These included some individual forensic scientists, sole practitioners, representatives from small-scale and academic FSPs and other individuals with a special interest in the FSR role. Some of the submissions contained the statement of the forensic science experiences of the respondents and their affiliations, such as private, public or academic FSP. Based on this information, the lists of submissions were scanned for individuals who could answer the research

[339] https://search.ukas.com/#/tabbed/search?q=forensic%20science&ati=1

questions. The email addresses of some individuals who fit within the sampling criteria were added to the database of accredited FSPs. Overall, a database consisting of about 40 potential participants, representing 40 different practitioners and forensic science organisations was created, after which invitation emails were sent to all potential participants.[340]

The invitation emails contained the research information sheet and the informed consent form which explained the details of this study (Appendix II). The research information sheet contained the study aim and research questions, the selection criteria for participants, and the information about ethical procedures. The participants were informed that participation in this study was voluntary. Following the invitation emails, some independent practitioners, sole practitioners and private FSPs expressed interest in participation. The arrangements were made for the interviews, including date and format that were convenient for the participants. While no response was initially received from police forces, some small-scale providers also declined participation by citing concerns about their position in the precarious forensic science marketplace. One laboratory replied to the invitation email that:

> "…due to our position in the forensic market, our relationship with the Forensic Science Regulator must be carefully managed, so it would not be appropriate for me to discuss the impact of the Regulator."

Albeit this respondent advised that I keep an eye on the House of Lords' forensic science inquiry which was ongoing at the time of my data collection, for industry views about the FSR role. The respondent also made clear that their laboratory had submitted a response to the inquiry. The response from this participant also highlighted the limitation of this study, in that data was collected from only participants who were 'willing' to talk to me. This means that the study misses the experiences and views of individuals who, even though they may have relevant experiences to share about the FSR role and its impact, were unwilling to participate in this study.

To help increase the response rate, and especially participation from police force FSPs, reminder emails and the 'snowball' sampling approach was used. Thus, the individuals who have been sampled initially were implored to recommend potential participants who meet the sampling criteria—that is, can share some experience about the FSR role and its impact on forensic service provision.[341] For data protection purposes, some of the participants offered to forward the invitation emails on my behalf to their relevant contacts, instead of providing me with their contacts. Also,

[340] It must be acknowledged that the total number of individual practitioners and organisations who offer forensic services in England and Wales is unknown.
[341] Bryman (n 334), p.415.

personalised messages on social media (on Twitter) and through my Supervisor's network of contacts were used to advertise the study to potential participants who fit within the sampling criteria.

5.6 The participants

This study received informed consent from 18 participants. This number was within the target number. Given the contingent approach in the sampling process, the percentage of responses against the total invitation emails cannot be ascertained. The scope of acquaintances and interactions of the participants with the FSR role is summarised in table 5.1 below. Most importantly, the emphasis on the sampling criteria was met; all the participants were divided across the different classifications of FSPs. These included representatives from police forces (n=4); large-scale private providers (n=2); small-scale private providers (n=5); and independent practitioners (n=7).

Table 5.1. Characteristics of the study participants.

Classification	Participant (role)	Acquaintance with the FSR role
Police forces	R09 (Director of forensic science)	Accreditation
	R11 (Quality Assurance Manager)	Accreditation
	R14 (Director of forensic science)	Accreditation
	R17 (Director of forensic science)	Accreditation
Private providers		
Large-scale	R13 (Quality Assurance Manager)	Accreditation
	R02 (Director of forensic science)	Accreditation
Small-scale/sole trading	R04 (Director/expert witness)	Non-accredited
	R06 (Director of forensic science)	Non-accredited
	R07 (Director of laboratory/expert witness)	Non-accredited
	R15 (Director of laboratory)	Accreditation
	R16 (Director of laboratory/expert witness)	Accreditation
Independent practitioners	R01	Former quality assurance manager (private large-scale FSP)
	R03	Academic forensic practitioner and a former director (FSS laboratory)
	R05	Academic forensic practitioner and a consultant
	R08	Former director (private sector FSP)
	R10	Academic forensic practitioners and a consultant in policing
	R12	Solicitor (Special interest in FSR role)
	R18	Forensic Science Practitioner and a consultant in policing.

For data protection and anonymity, all the participants were labelled with a Code name "R" followed by their recording number. Further information such as the location of participants cannot be provided, because they can be identifiable for the participants or their represented organisation. The 11 participants from police and private FSPs were directors (n = 9) and quality assurance managers (n = 2) of their respective organisations. The seven independent practitioners consisted of individuals with a wide range of experiences and acquaintances with the FSR role. These ranged from retired directors and employees of both public and private sector FSPs. One participant (**R17**) was the director of a forensic unit of a regional police force collaboration which maintains and delivers forensic science capabilities for multiple police forces. All the seven independent practitioners were academics, who also undertake consultancy works for different FSPs. Overall, the participants had between 12 and 35 years of experience in active forensic science practice in the UK and internationally. This also meant that each of the participants had experienced the introduction of the FSR role and the work of the two Regulators who have occupied the FSR role. Four participants were previous members of the FSR's Advisory Council and Specialist Groups. Consequently, the immense and varied experiences of the participants with the FSR role demonstrated their legitimacy to answer the research questions.

The participants from private FSPs outnumbered those from police forces. However, perhaps, this may be due to the strict organisational culture within policing, which may stifle their participation in external research. This difficulty was anticipated from personal conversations with some practitioners at conferences who shared a similar difficulty with police forces' involvement in forensic science research.[342] An instance of low police forces' involvement in forensic science research had been noted in the FSR annual reports, concerning the difficulties with obtaining sufficient involvement and data from police forces as part of the Transforming Forensic Science programme in policing. However, even though the number of police force representatives were low in this study, the three independent practitioners with affiliations to police/public FSPs compensated for this potential gap.

5.7 Data collection

5.7.1 Semi-structured interview questions

The interviews were conducted using a semi-structured Interview Schedule of open-ended questions (Appendix III). The questions were divided under the four main research questions to

[342] I was told by some practitioners at the Autumn Conference of the CSFS in November 2018, which I attended and presented some aspect of my research purposely to widen my scope to obtain some participants.

allow the participants to express their experiences in detail. The Interview Schedule was peer-reviewed by two independent reviewers, after which an initial pilot study was conducted with two independent forensic practitioners. The pilot study was used to test the suitability and adequacy of the interview questions and interview duration. This provided insights and the opportunity to further revise the interview questions. One instance of critique was a question which would have required participants to give exemplary cases where 'errors' have occurred in their practice and how they had been assisted by regulatory interventions to resolve cases. However, instead of 'errors', the reviewers recommended the use of 'non-conforming work' because the former was considered overly sensitive or provocative. Also, the pilot study was insightful in anticipating for flexibility in the order and style of the questions. In semi-structured interviews, encouraging flexibility and thoughtful rambling is advantageous, as it allows participants to share rich data about their experiences.[343]

The data collection commenced after the pilot study. A keen interest during the interviews was to pay attention to significant statements that were more emphasised by the participants to be able to ask further probing questions. For the first research question, the sub-questions required the participants to share their experiences, including opinions about the strength and limitations of the framework of the FSR role and the work of the Regulator. In sharing their experiences, one of the key themes that emerged was the 'lack of enforcement or statutory powers for the Regulator'. This showed the close relationship between the first and the third research questions. As a result, as this theme emerged, the order of questioning in the Interview Schedule was adjusted by asking the participants to share their perceptions about the FSR Bill—which was the third research question and the last but one block of questions in the Interview Schedule. The participants were asked to comment on any positive and/or negative implications they envisage about the statutory powers proposed in the FSR Bill. Even though this showed a deviation from the order of questioning, it made it easier to ask the appropriate probing questions, without losing track of the salient points in the participants' responses to the previous questions. This also helped the participants to link their responses to both questions together.

For the second research question, the objective was to identify some positive and negative impacts of the FSR programme of work on the work of FSPs in England and Wales. The nature and style of the questions were adjusted to suit the diversities of the participants. For instance, while the seven independent practitioners were asked to share their experiences about both positive and negative impacts that the Regulator's programme of work has had on the practice of FSPs in

[343] Bryman (n 334), p.466.

general, the 11 representatives from private and police force FSPs were asked to be specific about the impact of the FSR role on their practice and FSPs across the board. By this approach, both subjective and objective experiences were gathered. The participants were asked to share instances where they have taken some actions in their routine practices as a result of any of the Regulator's programme of work or requirement. The participants were also asked to share the outcomes of those actions. For instance, whereas participants from accredited FSPs were asked to share the impact that accreditation has had on their practice, an unaccredited FSP could share any impact of any regulatory requirements or guidance. The impact of the forensic marketplace was also probed.

Further, some questions were maintained for all the participants. These included questions about the impact that the Regulators' approach of managing the risks of quality failures in forensic science service provision. Specifically, the participants were asked to share their experiences about how investigations of quality failures and recommendations by the Regulator affect the practice, behaviour and motivation of FSPs to identify, report and address cases of quality failures. Overall, by asking broad open-ended questions about the positive and negative impacts of the Regulator's programme of work, the data analysis focused on determining from the responses of participants whether the purposes of the individual components of the FSR role are being achieved. These responses were then discussed/evaluated in terms of how they relate to the individual requirements of forensic service provision demanded of FSPs by the CJS.

Thus, instead of asking FSPs to directly comment on how regulation was helping and improving their practice to meet the individual requirements of forensic service delivery expected by the CJS, this was co-constructed or co-interpreted from FSPs' responses to the impact of the specific programmes of the FSR role. In so doing, the discussion chapter sought to explore the extent at which the Regulator's specific quality standard programmes are achieving some outcomes against the overall purpose of the FSR role. By this approach, the hermeneutic approach of phenomenology was illustrated, by describing not only the participants' individual experiences about the FSR role but also the implications of the Regulator's programme of work on the quality of forensic service provision in general. Lastly, the interviews ended with a broad question for the participants to make recommendations for changes or improvement in the approach of forensic science regulation in England and Wales, and to share any further comments and information they deemed relevant to the FSR role.

5.7.2 Interview and Recording

All participants consented to be interviewed anonymously and to be recorded. The interviews were conducted between September 2018 and April 2019. The convenient dates, times and formats of

the interviews were chosen by the respondents. Of the 18 participants, all but one were interviewed via telephone. The telephone interviews were preferred by the participants for several reasons. In addition to their dispersed locations from the study location (Newcastle), some of the participants, especially the representatives from the police forces and private FSPs stated that they were busy because of operational casework. As a result, telephone interviews were agreed by the participants for convenience. This was also cost-effective, in terms of cost and time to travel for data collection. The only face-to-face interview was conducted because the participant (an independent practitioner) was relatively close to the study location.

All the interviews were recorded and lasted between 25 and 60 minutes, depending on the depth of responses of individual participants. Another contributing factor for the interview duration was that both the data collection and transcription of the interviews proceeded simultaneously, such that, as the key themes from the data were being monitored at early stages and throughout the data collection process, this influenced and improved the subsequent interviews. Thus, later interviews became more straightforward than previous ones. Some measures were taken to address some concerns about qualitative interviews in general, such as obtaining clear recordings and establishing rapport with participants. Also, some measures were taken to address some difficulties anticipated of telephone interviews concerning the clarity of recording and establishing rapport with participants.[344] For instance, to establish rapport with the participants, all the interviews started with introductory open-ended questions. This allowed the participants to provide brief information about themselves, such as their interest in forensic science, familiarity with the FSR role, experience/active practice in the forensic science field, and details of services provided to any law enforcement agency or the CJS. This also helped to initiate some comfortability for the participants to answer the subsequent questions. The details of their affiliation also helped in the subsequent data analysis.

Also, in addition to ensuring participants' anonymity, lone and quiet rooms were used for all the interviews to obtain clear interview recording by avoiding distractions and noise. Therefore, all the telephone interviews were of good quality for transcription as the face-to-face interview. Given that only one face-to-face interview was conducted, a comparison with the telephone interviews, in terms of rapport and depth of responses by the participants cannot be ascertained. The inability to compare the level of rapport or depth of responses between the telephone and the face-to-face

[344] Bryman (n 334), p.484.

interview did not affect any interpretation from the data. Rather, the variation in the interview duration was insightful about the individual and relational experiences of the participants.

Even for studies which have utilised both telephone and face-to-face interviews, no noticeable difference has been reported, in terms of the rapport with participants and the depth of data.[345] Also, in terms of the willingness of participants to share some rich data, the literature has found that participants prefer telephone interviews to face-to-face interviews, especially when sensitive issues are involved.[346] In this study, the response of the respondent who declined participation suggested the possibility of some level of sensitivity in the issues related to the FSR role and the forensic science sector in general. Notwithstanding, the willingness of the participants to answer the questions was demonstrated in their rich responses, as will be evidenced in the Results and Discussion chapters.

5.7.3 Adequacy of sample

For qualitative studies, the literature indicates the challenges of determining the adequacy of a sample number that can be appropriate for generalising the data.[347] Yet, instead of generalisability, it is suggested that sample adequacy be based on the specific research question.[348] In this study, the sample adequacy was decided using insights from the literature and the interview data. Firstly, by meeting the sampling criteria of purposefully sampling for participants from each of the different classifications of FSPs, coupled with the immense experiences of the participants with the role of the FSR, the sample fulfilled the requirements of a phenomenological study.

Secondly, the adequacy of the sample was decided when it emerged that the key themes had reached saturation. This is known as data saturation, which refers to the point in data collection when no new information or themes are observed in the data.[349] Specifically, the data saturation was observed from the repetition of key themes from the participants' responses to the interview questions. The simultaneous interviewing and transcription process helped in monitoring the emergence of key themes from the data. Also, the varied data sources for this study, comprising the findings of the document analysis and the semi-structured interviews with FSPs, and other

[345] Muhammad Farooq and Charl Villiers, 'Telephonic Qualitative Research Interviews: When to Consider Them and How to Do Them' (2017) 25 Meditari Accountancy Research 291.
[346] Laurie Drabble and others, 'Conducting Qualitative Interviews by Telephone: Lessons Learned from a Study of Alcohol Use among Sexual Minority and Heterosexual Women' (2016) 15 Qualitative social work : QSW : research and practice 118.
[347] David Silverman, *Doing Qualitative Research: A Practical Handbook* (3rd Edition, Sage Publications 2010), p.192.
[348] Creswell and Poth (n 323), p.158.
[349] Bryman (n 334), pp.416-418.

factors, such as the purposeful sampling approach and the rich experience of participants from different groups of FSPs, offered a strong basis for drawing generalised conclusions from the data.

5.8 Interview data analysis

5.8.1 Transcription

The data analysis commenced with the transcription of the interviews, which proceeded simultaneously with the data collection process. This procedure followed the recommendation of Creswell and Poth.[350] In addition to facilitating the decision about the sample adequacy, this procedure was helpful as previous interviews influenced and improved the structure of later ones. For the transcription of the interviews, the decision had to be made whether to transcribe the interviews manually or to use a software-assisted programme. However, for data confidentiality and anonymity, the transcription was done manually. Even though the manual transcription was time-consuming, it offered the benefits of familiarising with and understanding the data from the early stages of the data analysis, identifying and tracking key emerging themes from the data, and identifying differences and similarities between the responses of the participants.

5.8.2 Coding and generation of themes

Following the transcription process, the transcripts were managed and organised for further analysis using the NVivo software programme (version 12). The thematic analysis approach was used for data analysis. Thematic analysis is a method for identifying, analysing, organising, describing, and reporting themes found within a set of data.[351] This approach was used in this study because of the aim of identifying and reporting patterns of experiences and views that FSPs have towards the FSR role and its impact. The procedure for identifying themes from the transcripts followed the recommendation of Wertz, *et al*.[352] Firstly, each of the individual transcripts was read openly, without any reference to the research questions or identifying any significant statements from the transcripts. Secondly, each transcript was scrutinised through repeated reading to identify any significant statements or phrases that were relevant to the research questions. These statements ranged from a few sentences to much longer descriptions. This process is also known as coding and refers to the process of aggregating texts into small categories of information, also known as

[350] Creswell and Poth (n 323), p.158.
[351] Lorelli S Nowell and others, 'Thematic Analysis: Striving to Meet the Trustworthiness Criteria' (2017) 16 International Journal of Qualitative Methods 1.
[352] Wertz and others (n 331), p.131.

codes.[353] Thirdly, these significant statements from the individual transcripts were used to generate broader themes based on what each statement revealed about the four research questions.

The themes were generated based on the recurrence of significant statements across a number of transcripts. Thus, statements that were common across a number of participants were grouped under a common theme, according to how the participants shared their views and experiences about a question in a similar way. It was at this stage that the interpretation and co-interpretation of the experiences of participants were also sought. Based on the description and interpretation of common recurring statements, two types of themes were developed. These were the super-ordinate themes and sub-themes. The super-ordinate themes captured the central concept of the common, recurring experiences across a group of participants. The sub-themes captured the different facets of how individuals or a group of participants described the central super-ordinate themes.[354]

The sub-themes were developed through a prolonged reading of the transcripts and memoing of ideas to understand the meaning of significant statements in totality to a group of participants. Following, the super-ordinate themes were generated by reviewing and refining the sub-themes by comparison with the research questions. Thus, while the super-ordinate themes are descriptive experiences at the broader level of the research questions, the sub-themes are descriptive at the level of a group of participants. As a result, the sub-themes convey the convergence and divergence and the commonality of how a group of FSPs described their experiences. The super-ordinate themes, on the other hand, captured the essence of these experiences. Finally, both themes were compared with the transcripts and with each other to resolve double coding, to check for code and theme overlaps and to test the consistency of the super-ordinate themes and their application to the research questions.

5.8.3 Bracketing

In phenomenology, intentional data analysis is acknowledged.[355] This means a data analysis procedure which is focused solely on the relational meaning of the experiences of participants that are inherent in their interactions with the phenomenon under study. To do this, bracketing is recommended. Bracketing is a procedure whereby the researcher sets aside all prior knowledge about the phenomenon under study to focus on the description of the phenomenon by the participants.[356] In bracketing myself during the data analysis, the recommended approach by Wertz

[353] Creswell and Poth (n 323), p.190.
[354] Jonathan A Smith, Paul Flowers and Michael Larkin, *Interpretive Phenomenological Analysis: Theory, Method and Research* (SAGE Publications Ltd 2009), p.106-107.
[355] Wertz and others (n 331), p.136.
[356] Creswell and Poth (n 323), p.201.

et al.[357] was adopted, by generating themes of experiences and views of participants through repeated reading of the transcripts, memoing of ideas and comparison of the significant statements with the research questions.

However, a further limitation of this study was that my prior knowledge about the FSR role gathered from the document analysis could not be completely set aside during the coding and the memoing process. This is because, even though some of the theme definitions or names were based on my understanding and interpretation of the central concept that was being described in a group of significant statements by participants, this was also partly influenced by my previous knowledge of some key issues that had already been captured in the document analysis. As a result, some measures were adopted to minimise any potential weaknesses in my interpretation of the participants' responses. These included the use of extracts in the transcripts as code/ theme names, such as phrases that captured the central concept of experiences from among the group of significant statements. Also, the validation techniques below were used to minimise any potential biases in the data analysis process.

5.8.4 Validity of the data analysis

In qualitative studies, researchers must demonstrate the credibility of their study. Several terms are used to describe the credibility of a qualitative study, including authenticity, rigour, verisimilitude, adequacy, trustworthiness, and validity.[358] In this study, validity was adopted based on the definition by Creswell and Miller.[359] Validity is described as how accurately the data and the inferences drawn from them represent the participants' experiences of the phenomenon under study and are credible to them. Several recommended procedures can be used to demonstrate the validity of qualitative studies; however, the procedure(s) chosen for a particular study should be guided by two perspectives: the paradigm assumptions of the study and who the researcher would want to check the accuracy and the interpretation of the data.[360] The latter may be the researcher, the participants, or individual(s) external to the study. As a result, the validation procedures for this study were guided by these two suggested criteria.

The interpretative framework/paradigm of this study as explained earlier, was social constructivism. Thus, the study was underpinned by the assumption that individual FSPs may have multiple and subjective intentional experiences about the fitness of the FSR role, informed by their

[357] Wertz and others (n 331), p.136.
[358] John W Creswell and Dana L Miller, 'Determining Validity in Qualitative Inquiry' (2000) 39 Theory Into Practice 124.
[359] Creswell and Miller (n 358).
[360] Creswell and Miller (n 358).

subjective interactions with the FSR role. In this light, in addition to the bracketing procedure, it was necessary to adopt a procedure for validity checking that will ensure that the intentionality of experiences and the proximity between the participants and the data are not eroded in my interpretation of the data. This was necessary, because of my involvement in the development and definition of the thematic experiences. Thus, as the meaning to the data were (co)-constructed between both the participants' descriptions and my understanding of these, validity checking through three lenses was more appropriate. These were the member checking, thick-description and peer-review procedures.[361]

Firstly, for the member checking procedure, the interview transcripts were sent back to the participants to confirm the credibility of the interview information and the narrative account. This procedure was helpful because, as the majority of the data were collected through telephone interviews, it offered the opportunity for some of the participants to amend any mistakes in the transcripts caused by mishearing of words. Also, some of the participants amended their transcripts by removing some information they deemed were personal and identifiable. Thus, in addition to checking the validity of the data through the lens of the participants, the member checking procedure provided further scrutiny for the confidentiality and anonymity of the participants. Some of the participants also used the opportunity to amend or remove some previous responses they thought were exaggerative. For instance, one participant, ***[R02]***, in commenting about the limitations of the FSR responded that "*the Regulator doesn't have peace.*" However, during the member checking, the participant requested that this be amended as *"the Regulator doesn't have powers."*

The second validity procedure was the thick-description, which refers to the procedure of describing deep, dense, and detailed accounts of the experiences and the setting of the participants.[362] This was illustrated through direct quoting of extracts from the transcripts and providing some background information about the participants. This ensured transparency and added depth to the descriptive account of the thematic experiences (illustrated in the next Results chapter). Finally, a peer-review process through supervision feedback and comments from other students and academics during presentations of aspects of this study at conferences provided some external scrutiny for this study. Rather than using it as a post-study assessment, the peer-reviews helped to critique the justification of the methodology; to ascertain whether the findings were grounded in the data, and to examine the truthfulness and logic between the findings and the

[361] Creswell and Miller (n 358).
[362] Creswell and Miller (n 358).

interpretations drawn from them in relation to the research questions.[363] As a result, the peer-review process provided external scrutiny for the bracketing procedure and the process of generating codes and themes which, in themselves, are self-lens procedures for demonstrating validity.

[363] Brigitte S Cypress, 'Rigor or Reliability and Validity in Qualitative Research: Perspectives, Strategies, Reconceptualization, and Recommendations' (2017) 36 Dimensions of Critical Care Nursing 253.

Chapter 6. Results

This chapter details the descriptive account of the interview data. Each of the super-ordinate themes is described briefly, in terms of how it applies to the key research questions. The details of each sub-theme are then discussed in turn. As each sub-theme consists of recurrent experiences, the descriptive account is a summary of how the sub-themes apply to a group of participants. For each sub-theme, the emphasis was to describe the multiplicity and the range of experiences and views shared between and within a group of participants who respond to a particular question in a particular way. This is illustrated by using a generic approach of interpretation to summarise the key concepts of each sub-theme.

The generic interpretation comprises phrases, such as 'the majority of the participants' and 'some of the participants.' The former was used when the number of participants is more than half of the total number of participants while the latter is used if the number is less than half. Where appropriate, multiple extracts from different participants were quoted to illustrate the range of experiences and opinions. However, in quoting the extracts, the emphasis was to select extracts that are rich in illustrating the central points of the themes. As a result, some themes contain multiple extracts from a single participant. This procedure is permitted in qualitative phenomenological studies when a large number of participants are involved.[364] The rich extracts included those where the participants used metaphors to illustrate their experiences. However, to demonstrate the multiplicity and generality in the data, the selective approach did not overdraw from a small number of participants, as extracts were quoted from each of the participants based on the richness of the extracts.

[364] Smith, Flowers and Larkin (n 354), p.110.

6.1 Research question one: What structural and contextual factors impact upon the FSR role and affect the operations of the Regulator?

6.1.1 Strength of the FSR role: the FSR is an agent of good practice in the laboratory setting

6.1.1.1 Raising standards for consistent laboratory practices

The forensic science sector was described by some participants as a diverse, "murky" sector where variation in standards for carrying out forensic science practices had existed in certain areas, especially in the police sector. The FSR role was, then, described as important because the successive Regulators have been able to create a UK-wide set of forensic science quality standards to which all FSPs can refer. The general interpretation of the importance of the FSR Codes was that it provides an "evolving" framework of requirements, guidelines and recommendations for FSPs to work within:

> "…the Regulator's role has got a very clear grip over the last 10 years of the evolvement of quality standards. The improvement that could be given has been an evolving picture and continues to be an evolving picture to the benefit of the forensic science community." **[R13]**.

Some participants gave different perspectives about the FSR Codes. Participants from individual laboratories focused their views upon the two successive Regulators' insistence on accreditation of FSPs to the FSR Codes. The participants believed that this has created the opportunity for forensic science activities across different laboratories to be consistent and transparent. A participant from a large-scale private FSP shared the experience that:

> "… [the Regulator] is beginning to make an impact but this has not gone as far as they [the FSR role] would like. The impact is to improve the accuracy of forensic science and the traceability of it. I think it's not much [to do] with the private providers. It is more to do with extending a quality culture throughout and trying to push for a scenario whereby if you have your fingerprint or footmark or whatever analysed in one laboratory or one police force and then send it to another one you would get the same answer. I think that's it, accurate and consistent, that's what's being pushed for and that's where it is beginning to have an impact." **[R02]**.

Like the participant above, some independent practitioners and sole-traded specialist providers also believed that the FSR role has extended a 'quality culture' to police forces and other forensic science disciplines where some good practice had been neglected "*for a long time*". An independent practitioner affiliated to a police force FSP referred to the Regulator's guidance document on the cognitive bias as *"one of the better bits of guidance from the forensic science Regulator that seems to be much better supported".* **[R10]**. Another small-scale specialist provider also commended the Regulator's guidance document on DNA mixture analysis, indicating that it talks about the problem

of qualitative reporting. The participant described this as quite interesting *"because [the Regulators] are very clear in the guidance that [qualitative reporting of DNA evidence] is not an acceptable approach and shouldn't be used anymore."* **[R15]**.

Among the police participants, the majority shared mixed experiences of the FSR role. Even though generally supportive of the FSR Codes and accreditation, some participants expressed discomfort with some of the Regulator's requirements, including strict accreditation deadlines, and the cost of complying with the regulation. The extract below was the response of a Director of a police force forensic department:

> "…mostly it's been a pain for me because we have to accredit our lab, we have to accredit our scenes of crime processing, we have to accredit what happens in our fingerprint bureau, and for the most part, it doesn't make any difference to what we do. We just get somebody in to watch you do it, then you have to pay them in order to get them to do that." **[R09]**.

The participant, however, explained the usefulness of regulation as follows:

> "So, if I was looking for a new lab to send things [samples] to, I would expect them to be accredited or I would expect them to be trying to become accredited because I think that that shows an aspiration to be doing things in accordance with an international standard... But it doesn't necessarily mean anything in or of itself, but it's a good indication of the ethos within that company or in that laboratory." **[R09]**.

The two extracts above show contradictions in how the same participant views the FSR role. While seeing the importance of the FSR, the contradictory response was due to the cost of accreditation, which almost all the participants from individual laboratories referred to as expensive. Notwithstanding, almost all the participants indicated that they view the FSR role as vital in steering forensic science practice in the laboratories. Another police participant admitted to the challenges of the cost of compliance with regulation because of cuts to police funds for forensic science. However, citing some recent cases of quality failures and the overall challenge to police funding, the participant reiterated the need for the FSR role because of the potential negative impacts of these failures and funding cuts. The extract below was the participant's perspective:

> "I know the Regulator very well and she is quite balanced. She will listen to people, but she sticks to her guns when she needs to. So, a lot of people say, 'can't she move the deadline [for accreditation] back'? But, I think the role is absolutely vital in steering forensic science…If you are cutting money and cutting the budget, the quality setting becomes more paramount, because the danger is you haven't got the funding so your work becomes shoddy because you haven't got the correct things in place." **[R17]**.

6.1.1.2 Forensic science methods validation for robust practice and risk mitigation

Majority of participants shared their perception, and experience of the FSR role in terms of managing risks within forensic science practice. The majority of participants held the view that the approach of the FSR is correct, referring to the Regulators' insistence on the validation of scientific methods used by FSPs. It was mentioned that any (new) method has the potential to have a significant impact on a criminal investigation and trial. To safeguard against any potential errors with novel methods, the majority of participants explained the need for validation to ensure that the limits of any method are known and documented. By insisting on validation, there was a tightening up of the verification of novel methods before the results from such tests could be relied upon. It was, thus, emphasised that the FSR role is creating the opportunity to reduce or mitigate errors associated with the provision of forensic science. Notwithstanding, the majority of participants were of the view that the Regulator's role can only mitigate the risks of quality failings rather than completely prevent them. This limitation was ascribed to the inevitable human involvement in the forensic science process. A police participant put it this way:

> "[The Regulators' approach] could only ever be risk mitigation. It doesn't guarantee and it will not guarantee that there won't be errors or someone deliberately bypassing the system because at the end of the day we have humans involved." **[R14]**.

A participant from a large-scale private FSP stated that "*the approach taken by the Regulator means there should be fewer errors in the future*". **[R02]**. Another from a private large-scale FSP also pointed to the requirements for validation by the FSR role, as where you start to "*see the benefits*" of regulation. However, the experiences of participants implied that the benefits of the Regulator's insistence on validation are not automatically obvious to all, but rather linked to individual FSPs going through the validation process. This was captured in the response below.

> "…the validation process that is in place as an outcome the Regulator's requirement has been a massive enabler in driving us to the route of forensic science validity.., it should reduce risks within the marketplace, reduce risks within forensics through the application of those approaches." **[R13]**.

Notwithstanding this opportunity, the general experience of participants from individual laboratories was that the validation process is difficult. A small-scale specialist provider shared mixed feelings about the validation process that "*the accreditation is one thing, and the Regulator has added value to that accreditation. It feels a bit like you are doing the same thing twice, so it is a bit repetitive, but it does add value."* **[R15]**.

This experience of a difficult validation process was experienced by all the police participants, with respect to validating their digital forensic science methods and activities. Even though all the police participants indicated that they perform some digital forensic activities in-house, such as the analysis and extraction of data from hard drives and phones, the common experience was that the ever-changing digital space makes both validation and obtaining accreditation for digital forensics problematic. As a result, all these participants confessed that they missed the deadline for accreditation for digital forensics. This raised questions as to whether the opportunities for risk mitigation are available across the wider forensic science activities being carried out within policing. The extract below captures the experience of a police participant:

> "In the digital space, it is much more challenging because building a system and being assessed, you have to show that you have got a validated process. Within digital forensics, the processes have to change constantly, almost on a day-to-day basis as a new piece of software comes out, as a new phone comes out, as a storage increases and as the encryption changes. So, you are constantly doing this research and development work. What that means is that validating your processes becomes much more challenging." **[R14]**.

6.1.1.3 The FSR role is creating opportunities for learning lessons

The majority of participants felt they benefit from the investigation of quality failures by the two successive Regulators. Through consistent explanations, the participants applauded the Regulators in this respect, stating that through the investigation of quality failures they "have opened up lessons for learning", by bringing more cases of quality failures into the open across the wider marketplace. For instance, a police participant expressed admiration that *"[the Regulator] is taking note and spreading best practice."* **[R11]**. In response to the investigation of cases, some participants from both private and police force laboratories also gave instances where this has increased the level of awareness in their practice. A participant from a large-scale private laboratory admitted that "*ever since the Randox thing [scandal] started, right from as soon as it hit, we have looked at certain things that we did and have asked whether this can happen in our organisation".* **[R02]**. A police force participant also shared the following experience:

> "We have certainly acted on some of the feedback, you know. There is something recently circulated about a problem in cybercrime, and we have circulated the issues here and taking some actions to ensure that the problem doesn't occur in our force." **[R11]**.

In particular, the approach by which the Regulator disseminate information about quality failures, investigative findings and recommendations across the board was commended by participants from individual laboratories. Some participants acknowledged the Regulators' intention to maintain confidentiality and stated that lessons are being learnt from individuals' mistakes, yet while still

maintaining confidentiality during information dissemination. The extract below was the experience of a participant from a large-scale private FSP:

> "There [has been] a level of confidentiality, so, the Regulators will disseminate the information on a more generalised basis, so we can still learn the lessons without knowing the minutiae of who and what is going on… and it is up to us, then [as providers], to go into our organisations, have a look at our processes and discuss them amongst ourselves..." **[R02]**.

Notwithstanding the intention for confidentiality to be ensured, some concerns were raised about bad publicity arising from quality failures and resulting investigations. Some participants thought that bad publicity could contribute to a blame-game which can potentially hinder individual FSPs reporting cases to the Regulator for investigation. An independent practitioner emphasised this was a genuine concern, stating that "*the Regulator does not have the powers to compel organisations to report cases*" and this makes the goal of the Regulator to minimise the risks of quality failures "*kind of meaningless*." **[R10]**. However, some participants mentioned and commended the current Regulator's initiative to publish "lessons-learnt" documents and recommendations following investigations of quality failures. In the extract below, an independent practitioner thought that this will encourage a "no-blame culture" and "lessons-learnt culture" across the wider community of FSPs:

> "… [The Regulator] is trying to move away from a blame culture to a lessons-learnt culture and no-blame culture, where it is acknowledged that it is the system that needs to be fixed, rather than for a particular individual or individuals to be blamed. And I think that's a very important move." **[R05]**.

6.1.1.4 FSPs are motivated for accreditation and have support for regulation

Participants were asked to share their experiences of how regulation impacts the accreditation of forensic science providers. In response, most of the laboratory participants, from both police and private FSPs, stated that some or all their forensic science methods are accredited to the FSR Codes. Notwithstanding, most of the participants also stated that their methods had been accredited to the ISO 17025 standards and, thus, have been transitioned to the FSR Codes. Participants were asked about their motivation for achieving, maintaining or extending accreditation. In repeated responses, both private provider participants and police participants indicated that their motivation for accreditation is, primarily, internally driven. The participants were internally motivated that accreditation is the means to minimise and mitigate risks in forensic science practice. As a result, in the extract below, a police participant described accreditation as essential:

> "…the main motivation is that accreditation and quality standards are my [means of] mitigation of risks. That is absolutely how we mitigate risks in forensic science; the risks of wrong identification, or a missed identification... ISO 17025 doesn't guarantee that you don't have errors, but it certainly mitigates the risks of errors...by ensuring that you have got everything from staff competence, organisational competence, you have got a regime for reporting errors, you have got the training and competency regime and validation of results. So, the motivation really comes from [accreditation] is the right thing to do in order to manage risks on behalf of the criminal justice system." **[R14]**.

By being already accredited to the ISO 17025 standards and further extending to the FSR Codes, a participant from a private large-scale FSP experienced the Regulator's Codes as an opportunity to build upon and improve their "*robust quality culture*" and "*management systems*". With a similar explanation, another participant from a private large-scale FSP also experienced that extending accreditation to the FSR Codes was "*not too big a job*". In the extract below, even though the participant described the Regulator's Codes as the "*biggest impact*" on their forensic science practice, the participant stated that the "*Regulator's push for high-quality analysis has not made a lot of difference*" to their forensic practice because they were already accredited to the ISO 17025 standards:

> "[The Regulators'] biggest impact on us at the moment is because they have written the forensic science regulator guidelines [Codes]. We were already accredited to UKAS for our general works. However, when they brought out the Forensic Regulator's guidelines, we then had to get accredited to those as well. That's not too big a job because a lot of the boxes that were required, we were already ticked because we were UKAS accredited…So in a way, the Regulator's push for high-quality analysis hasn't made a lot of difference to us because we were already doing it." **[R02]**.

The police participants also stated that they are following the Regulator's Codes of Practice. However, they revealed their struggles in meeting deadlines for accreditation and indicated that transitioning from the ISO 17025 to or gaining accreditation to the FSR Codes has been difficult. The difference between accreditation to the FSR Codes and ISO 17025 standards was explained by a police participant as below:

> "...the 17025 is much more [about] the laboratory tests and the Regulator's Codes is much more around everything surrounding that, in terms of impartiality, business continuity [and] relationship with [private] providers..." **[R14]**.

Some police participants shared individual difficulties in gaining accreditation to the FSR Codes, such as being a smaller-sized police force with few resources and expertise. Other difficulties were also felt across all the police participants, especially for those who had no previous experience of accreditation to the ISO 17025 standards. For these participants, some emphasised that regulation has been a motivation for accreditation. For instance, a police participant disclosed that for more

than twenty years in providing fingerprint enhancement and comparison works, DNA and footwear screening, their scientific support unit had no scope of accreditation to ISO 17025 standards. The participant, therefore, emphasised that they struggled with gaining accreditation to the FSR Codes of Practice because accreditation was a "*new area*" to them. In the extract below, the participant elaborated on the struggles of gaining accreditation recently, including financial difficulties and difficulties getting the staff's "*mindset right*" to work in the new culture of accreditation:

> "Accreditation is a new area for us, you know. We are not really used to it, so it has been difficult to get everyone's mindset right from working to accredited processes. We have struggled to get staff buy into [accreditation] really. So that has been difficult. It has been hard work for police forces, no doubt about it! We set up our bureau in 1995. So, we have our own labs running since then. But it is only in the last six years that we have had accreditation in place." **[R11]**.

6.1.1.5 Scope of accreditation of forensic science providers

To evidence their motivation for accreditation and support for regulation, the participants provided an account of their accreditation status. Of the eleven laboratory participants, the majority of them had accreditation covering the different forensic science services they provide. All four police participants stated that their laboratories have accreditation covering a wide range of forensic science activities. The individual accreditation included for fingerprint enhancement, fingerprint comparison and search (in fingerprint bureaux), footwear screening, DNA 'clean room', body fluid examinations, and search and recovery of trace evidence. However, all police participants stated that they have gaps in accreditation for some digital forensic activities and crime scene examination work. All the participants indicated that even though they missed the Regulator's deadline for accreditation for these forensic science areas, they are working towards getting accredited.

It was found that the two large-scale private providers had the full scope of accreditation for a wide range of forensic science services, including DNA analysis, drugs and toxicology. For the small-scale specialist providers, two out of the five participants had a scope of accreditation for the forensic services they provide for both defence and police customers. These included DNA-typing works, such as Short Tandem Repeat (STR) generation sequencing, phenotyping, ancestry testing, age, and metagenomics. Three out of the small-scale participants were not accredited for their digital forensics and casework review for defence customers. For casework review for defence customers, the participants indicated that accreditation is not yet required as arrangements are still in progress by the Regulator to ensure the appropriate quality standard requirement for accreditation.

Some of the independent practitioners had observed some gaps in the level of accreditation between private forensic science providers and police forces. An independent practitioner thought that *"before the Regulator's role came in, most of the [private] providers in the marketplace had those standards already, and so for [the Regulators] to take credit for that would be quite fanciful."* **[R08]**. In the extract below, a police participant agreed to this and explained further the causes of gaps in accrediting police forces' forensic science practices. From their laboratory's own encounter with accreditation and regulation, the participant explained that before the FSR role was created, there were gaps in accrediting forensic science practices across policing in general because of lack of a "*huge cultural piece*" about regulation and accreditation. Because of this, the participant explained that some police forces have faced difficulties with accreditation, with some being resistant to accreditation and blaming accreditation because it is bureaucratic and costly:

> "So, there is a huge cultural piece about accreditation and regulation which isn't about 'bring [UKAS] in, tick a box, and forget about it'... But I am not sure, within senior policing in some areas, whether that is necessarily acknowledged. Because I can recall even some of my own counterparts in other forces being very resistant to accreditation on the basis that it was costly, bureaucratic and [asking] what problems was accreditation, sort of, trying to resolve. **[R14]**.

6.1.1.6 FSPs are committed to reporting high-risk cases of quality failures

Majority of laboratory participants felt it obligatory to report cases to the Regulators, because of the requirements of the FSR role. They also stated that rather than they are incentivised by the Regulator to report cases of quality failures, they do or will report high-risk cases of quality failures to the Regulator because there are outcomes to reporting cases. Firstly, most of the laboratory participants decided to report high-risk cases to the Regulator because of the lessons-learning opportunities associated with the investigation of quality failures by the Regulators. For this, some participants, from a police force, a private large-scale, and a small-scale FSP stated they have reported cases from their practise or other FSPs to the Regulator. In the extract below, a police participant stated that they have reported cases of wrongful identification in their fingerprint bureau to the Regulators. The participant indicated that reporting cases provide the opportunity for the Regulator to determine trends and commonalities in reported cases to see if there is a risk to quality on a national level across wider FSPs. The participant, then, emphasised lessons learning as the "*core thing*" for reporting "*mistakes*" to the Regulator.

> "…if we get wrong identification through our processes, we report that to the Regulator: And she has oversight nationally to see if there is a common theme, is there a common error and is there a risk we need to look at nationally? The barrier [to report cases] is people being honest enough and brave enough to be able to say we had a failure...A mistake is

> almost the core thing with the learning it offers you...; so we have sent a couple of quality failings to the Regulator" **[R17]**.

Some participants also shared experiences that they have reported quality failings about the work of other FSPs because they were "*unhappy*" about the results of their work. The participants indicated that they picked up these cases when they were providing competing evidence in court. In the extract below, a participant from a private small-scale FSP stressed that they would report "*systematic errors*" about their own work if they felt other service providers would experience the same error. The participant further stated that they will report these cases for the Regulators to disseminate information for learning lessons across a wider landscape of forensic science providers.

> "I would want to escalate [cases] to the Regulator not if there was an error that I had made that I put right or that I knew what it was, but if it was something that I felt was systematic in certain circumstances that other people would experience the same erroneous result or problem, then, if you send it to the Regulator, she can take it to her various expert groups and they can look at it and, perhaps, advise others or advise more generally about how this should be dealt with if people come up with it again." **[R15]**.

Some participants from private large-scale FSPs also stated that because of negative consequences of quality failures, they will report high-risk cases to the Regulator "*naturally*" because of "*passion for forensic science*" and "*sense of duty for justice*." A participant emphasised that they would report quality failures to show that their organisation is "*mature*", "*transparent*" and working in accordance with regulatory requirements. In the extract below, another also stated that they will report cases to the Regulators for "*good practice*", stating that they did report quality failures to the Regulators even before extending their ISO 17025 accreditation to the Regulator's Codes:

> "Well, before we were accredited to those Codes, we did [report cases] anyway, as did all of the major [large-scale] suppliers. That's what we do, and we do all our work together to a certain extent because what we want is a good provision." **[R02]**.

In the extract below, the participant reiterated the ramifications of quality failures on private forensic science providers and emphasised the opportunity to learn lessons as the motivation to report cases of quality failures to the Regulators:

> "...for private forensic science providers, if certain people are making mistakes like Randox, that doesn't do the rest of us any good… we are all completely horrified because it puts the rest of us, our reputations, on the line. So, this whole lesson-learnt thing is the most important thing about reporting cases." **[R02]**.

6.1.2 Weaknesses of the FSR role: the FSR role is a difficult position

6.1.2.1 Limited oversight over forensic science

The majority of participants thought that the successive Regulators have not properly regulated forensic science, because only a fraction of the forensic service process is covered by the FSR role. Participants emphasised that the forensic service provision process includes both laboratory-based activities and non-laboratory activities. However, the participants experienced that the latter, including police forces' forensic activities at the crime scene and forensic case management decisions, are not covered by the Regulator. Some participants stated that this gap in oversight is due to the failures by both the successive Regulators who have occupied the FSR role to properly define forensic science. Because of this, it was felt that there is a lack of clarity in the remit of the FSR role. Observing this lack of clarity, some participants speculated that the direction of travel of the FSR role has been influenced by the different personalities and experiences of the two Regulators who have occupied the FSR role and their understanding of forensic science. In the extract below, an independent practitioner questioned the appropriateness of the title of the Regulator, given that oversight of forensic science by the FSR role is limited and unclear:

> "...ultimately the lack of proper definition of their role and remit is one of the difficulties that has dogged all the Regulators. Whereas if you compare the forensic science Regulator to the others, Ofcom, Ofsted and so on, their role is quite clearly defined and limited by scope, whereas the Forensic Science Regulator is not defined and compasses anything, from a police officer who picks up a mobile phone [to analyse] to a pathologist dissecting a body. So, that doesn't help the Regulators, it doesn't help at all!" **[R08]**.

In the extract below, another participant complained about the gaps in regulating forensic science, by stating some of the aspects of forensic science that "*are not part of the current remit of the forensic science Regulator or haven't been seen as part of the remit of the Regulator*":

> "It is not as though I don't think forensic science regulation in its current form doesn't work. It is just that it's much more limited than people think… Forensic laboratories are part of it [and] I am prepared to accept that [the Regulators] have made some contribution there... But apart from lab activities, there are whole other forensic activities which consist of trying to reconstruct events. Now that is still scientific and still requires expertise, but it is not covered by the current scheme and that's a big defect." **[R06]**.

Particularly, the independent practitioners who were affiliated with police forces shared instances of regulatory gaps from their consultation jobs within policing. The participants were worried that "*a large proportion"* of forensic science and decisions about using forensic science within policing are outside the oversight of the FSR role. Specific mention was made of police forces' crime scene activities and investigative strategies that inform evidence submissions to laboratories. A

participant described these activities as "*behind the search curtain*" and shared that because of hasty and poor forensic decisions, less evidence is being sent to laboratories for analysis and, hence, less forensic science is regulated, because the FSR role is focused on what happens in the laboratories. The participant concluded by sharing the following prediction:

> "I have said repeatedly that the next major miscarriage of justice in the UK will not be like the Randox case but will be associated with cases that [evidential] materials haven't been submitted in the first instance by police forces..., and the case then suffers later on in its life. **[R10]**.

Citing this lapse in oversight, another participant thought that there are gaps between forensic science being carried out in policing and the "*actual scrutiny*" of the quality of forensic science, indicating that the current FSR model is weak in assuring the quality of forensic science. This is captured in the conversation below:

> "…the problem with going back to the Regulator is you can only regulate what [evidential material] is submitted. You cannot regulate what is not found or what is not submitted [by the police]. And that is one of the problems. **[R18]**
>
> **Question:** Are you saying, then, that the FSR is not regulating much of the forensic process?
>
> "Absolutely! Because of course…the Regulators don't have any powers at all to poke their nose into policing…Neither if I am honest, is there one organisation now which has an overarching look at the whole process. We are still not looking at what this [forensic science regulation] means from the crime scene investigation end." **[R18]**.

6.1.2.2 The Regulators are overburdened

The limitations of the successive Regulators were also associated with the burden on the FSR role, due to the system of forensic science provision. It was indicated by the majority of participants that the forensic science marketplace is variegated, comprising different forensic science providers who provide a wide array of forensic science services. In contrast, the participants bemoaned stagnation in the remit of the FSR role to match the evolving commercialisation and the entry of new FSPs into the marketplace. Particularly, it was experienced that the Regulator does not have sufficient resources and capacity to oversee quality in the whole process of forensic science service provision. In the extract below, a defence scientist described the lack of capacity by the FSR role to monitor accreditation across the board of FSPs and thought that the successive Regulators have tried their best to oversee the quality of forensic service provision:

> "I think the Regulators have got their hands full, really, because they have got to try and get all the police forces to be accredited and all sorts of people; lone agents and small firms, like mine, that are doing such a wide variety of evidence types… I just can't see how a

> regulator with a very small workforce can regulate such a huge and varied market. There are just so many people in it." **[R07]**.

Even though all participants acknowledged the work of UKAS in accrediting FSPs, some participants experienced gaps in accreditation and indicated that accrediting the methods and processes of FSPs do not provide sufficient scrutiny of the quality of the forensic services they deliver. In addition, some participants also thought the Regulator does not have the capacity to monitor quality at that level of forensic service delivery because of the limited human resource capacity of the FSR role. In the extract below, a participant who was affiliated with a police force laboratory illustrated the gaps in monitoring the quality of forensic science at the "*technical level*", using Streamlined Forensic Reporting as an instance:

> "The Forensic Science Regulator with three people [supporting them] cannot put people on the ground to check if [forensic science] is done right… [and] there is no way that anybody in forensic science is going around and actually checking what work is being done on the ground at the technical level… if you look at the number of cases going through scrutiny in court with the Streamlined Forensic Reporting, people are just printing off automated statements…so there are fewer amount of cases that are being examined and scrutinised in court. So, how do we know if cases are being done correctly if fewer of them are being scrutinised by people outside of the organisations that provide the work in the first place?" **[R10]**.

In addition, it was found that the FSR role is misrepresented in terms of the remit and duties of the Regulator. Some participants thought that the successive Regulators have had minimal achievement because they are working in isolation from other agencies who provide general oversight for forensic service provision. Concerns were raised about the title of the Forensic Science Regulator, that it creates an impression that the Regulator is responsible for "*absolutely everything forensic science*". Citing similar concerns of misrepresentation of the Regulator's role, some participants thought that the FSR role is "*problematic and ambiguous*" and "*overburdened*". For these issues, some of the participants thought that the successes of the two Regulators are commensurate with how the FSR role has been set up and how the Regulators work. In the extract below, an independent practitioner compared the performance of the successive Regulators with the difficulties of the FSR role:

> "So, I think the successes of the Regulators have been minor but then I don't think that's the fault of either of the two people who have held the role in the last few years. I think that's because they were so limited and restricted into what they could do... And one thing that I have always been concerned about is the way the Regulator is portrayed and is talked about; it is as if the Regulator is one person. The role of the Regulator is bigger than one person! Regulation of forensic science needs to be talked about as a function of an office rather than a person who is responsible or not." **[R08]**.

6.1.2.3 The Regulators have got "no teeth" to enforce compliance

The majority of participants thought that the lack of regulatory powers for the FSR role is a limitation for the Regulator. The lack of regulatory powers was discussed in relation to two main problems. Firstly, some of the participants thought that the two successive Regulators have been clear about the requirements for quality and accreditation through the Codes of Practice and Conduct. However, they acknowledged the lack of enforcement powers for the Regulators to make compliance with these requirements binding on all FSPs. Without the ability to mandate the quality standards and compel accreditation, an independent practitioner, for instance, described the FSR role as an "*advisory body*" rather than it is a regulatory body. This was explained as below:

> "…the problem is that the government wanted [the Forensic Science Regulator] to be a Regulatory body, and it is setting standards and it doesn't have, up until now, the ability to really mandate them. It doesn't really have teeth! It is not a Regulatory body; it is more of an advisory body." **[R10]**.

The lack of enforcement powers was associated with gaps in accreditation for some police in-house forensic science activities. The participants from private FSPs and the independent practitioners thought that police forces, in general, have been intentionally failing to abide by the Regulator's deadlines for accreditation. In this light, it was explained that this is unfair to the major private providers who are required to have accreditation before they can bid for the contract and provide services to police forces. In the extract below, a participant from a large-scale private FSP stated that private FSPs generally have better quality management systems for forensic service provision than police forces and that this problem links to the lack of enforcement powers for the Regulators to enforce accreditation:

> "I think it is fair to say, and as a private provider, we are fully supportive of [accreditation]. That is a regime that we have worked on for decades, and from our point of view, we felt able to say 'why should people [defence scientists and police forces] be carrying out forensic science when they are not carrying it out to the standards that we [private FSPs] carry out, you see what I mean?" **[R02]**.

On the bias in accreditation requirements between police forces' laboratories and private providers, a participant thought that the effectiveness of the FSR role, in terms of ensuring and monitoring accreditation, should be judged by how the Regulator will get all police force laboratories to be accredited:

> "I mean if you ask the Regulators what their success is, they will say 'well, we got all these providers onto the ISO standards.' Obviously, they haven't been successful with most of the police in that regard. But that's because, again, they can't compel anybody and neither

> can they restrict the police to who they use to supply services, whether they have the standards or not. They can't even do that! **[R08]**.

All the police participants revealed how they have been unsuccessful in meeting some deadlines for accreditation, including for crime scene investigation and some digital forensic activities. However, describing accreditation as a "journey" and "a struggle", they attributed the failure of police forces to comply with accreditation deadlines to multiple factors. For instance, a police participant acknowledged the lack of enforcement powers as a factor for non-compliance, but also countered it by emphasising that "*the obstacles [for accreditation] are funding and resources if I am honest, and people believing in it."* **[R17]**. In the extract below, another police participant also described their struggle for accreditation, because of insufficient funding and resources, lack of personnel capacity and training to undergo the accreditation process. However, the participant acknowledged that failures across policing, in general, could also be associated with the lack of enforcement powers for the Regulator. The participant explained this by stating the lack of sanctions for police forces that could not meet deadlines and even referred to the Regulator's requirements for accreditation as "*recommendations*":

> "There are limitations with [the regulation]. I mean it hasn't got any teeth. So, [the Regulator] is making the recommendations…but we are struggling to meet the deadlines now. And in particular the digital areas, we've missed the deadline there for analysis and extraction of data from hard drives and phones. And the only penalty as such is that if we make a statement, we do have to openly acknowledge in the statement that we are not compliant with the codes of practice. And that's all that we are required to do. So, the Regulator has no regulatory power to close the department down... So, until the Regulator has got a bit more power, I don't think everyone is going to comply with everything." **[R11]**.

6.1.2.4 Lack of sanctioning powers

Secondly, the participants referred to the lack of regulatory powers in terms of the inability of the Regulators to sanction FSPs for breach of standards or quality failures. The crux of this limitation was explained from the viewpoint of the market approach of forensic science service provision. Some of the participants indicated their expectations when the FSR was created, that the Regulator would be able to take action against FSPs who may breach quality standards, including customer relationships between police forces and private providers that compromise the quality of forensic science. However, referring to previous high-profile cases of quality failures in some forensic science laboratories, some participants explained how expectations for sanctions have not been met because of the lack capacity of the Regulators in that regard. In the extract below, a defence scientist from a small-scale FSP described this disappointment in the FSR role:

> "...there are three important components here [in forensic science]; one is the customer, which is the police who don't understand the science; then we have got scientists who don't understand the law. So, the police want to contract scientists to produce results. Now, the scientists could simply produce all the results that the police want and, therefore, that's why you need quality [assurance] regulation, and I was hopeful that the Regulator may have played some role in proper quality management. But in every case where there has been an error, there has never been any sanction [by the Regulators] against the companies [involved]." **[R16]**.

Notwithstanding, the majority of participants acknowledged that the Regulators have investigated some cases of quality failures and issued recommendations across the sector. However, without the necessary powers to mandate these recommendations, some participants described these as "*just recommendations*". A participant from a large-scale private FSP described a worry about this that *"the Regulators can complain as much as they like but it doesn't make any difference. If somebody refuses to do something, there is nothing that the Regulators can do about it!"* **[R02]**. Some participants compared the FSR role with other quality assurance regulators and argued that the quality assurance functions and public confidence expectations of regulators reside in the powers to take sanctions against service providers and to ensure that recommendations are adhered to. However, referring to the FSR role as a "*strange place*", some participants criticised the ability of the Regulator to effect changes in line with the aim of quality assurance. An independent practitioner made a comparison and explained the problem with the FSR role as below:

> "… When you look at Regulators of industries, like Ofsted, they are all there to ensure that the public gets the best quality of services... and they can respond to complaints by members of the public and other bodies without the need to essentially ask the suppliers' permission to do so...But we have a forensic science Regulator, in name, who was established by one ministerial statement to the House of Commons, that all the ills of forensic science are taken care of... And, yet, they don't give them the resources or the powers to do it...Even if [the Regulators] say we found some terrible practices in the police force or in a [private] forensic science provider, they can do nothing about it, so that's a burden. They will take all the flack and all the responsibility but not be able to make it right, and nothing can change!" **[R08]**.

6.1.3 The Bigger problem: "the whole industry is on its knees"

6.1.3.1 "Police forces have got no money" for forensics and accreditation

A critical problem that was repeatedly explained was the lack of sufficient government funding for policing and for forensic service provision. All the police participants conceded that budgets for police forces have been cut, leading to decisions by police force authorities to cut funding for forensic science, including for accreditation. It was explained that this problem has also led to an apparent disregard for quality during the commissioning of some forensic science services by police forces. Firstly, police participants experienced the resource intensiveness of accreditation

and complained about the lack of preparedness for policing in general, in terms of adequate funding and resources to achieve (timely) accreditation. For these reasons, a police participant described gaining accreditation as "*lucky*". The participant recounted how, in addition to underestimating the resource intensiveness of accreditation, they were successful in achieving accreditation by recruiting quality assurance personnel from outside the forensic science sector to assist them. This experience was described in the extract below:

> "The obstacles are that police forces have got no money to invest in quality teams and systems. I am quite lucky that I have got a quality team and a virtual quality management system." **[R17]**.

In the extract below, the Director of a police forensic science department shared some thoughts about the problem of non-compliance with some accreditation deadlines by police forces and how this originates from economic-driven decisions and lack of support by police authorities:

> "Police Chiefs, whether Chief Constables or the Police and Crime Commissioners, all make decisions around how money is allocated. And many of them have taken money out of forensic science and also not really being particularly alive or sympathetic or understanding of the need for accreditation in forensic science." **[R14]**.

Secondly, without sufficient money, it was found that decisions about forensic science and compliance with regulatory requirements by police forces are rationalised. This included decisions to prioritise policing works in terms of how money is spent. An independent practitioner affiliated with a large-scale private FSP empathised with the financial pressure on police forces' funds and queried that *"if police forces are forced to put all their money into accreditation, then there is even less money to run the forensics, and so you can argue where a miscarriage of justice can happen*." **[R01]**. This was illuminated in the response of a Director of a police forensic science laboratory, who illustrated how evidence submissions for forensic analysis are cut short because of lack of money. For similar reasons, it was indicated that not only will it be problematic for police forces to comply with all accreditation requirements according to the timelines demanded by the Regulator, but also using the limited money on accreditation may be economically unsustainable. The participant, therefore, stated that the threat for any (potential) miscarriage of justice to happen from forensic science is because of lack of money for police forces to do forensic science properly:

> "…the biggest threat to a miscarriage of justice or to potentially allowing a miscarriage of justice is that we [police forces] don't have enough money! We don't have enough money, so, if I have six swabs from a crime scene, I might decide to only send three because I don't have enough money for the six. If the value in spending some of that limited money [is spent] on accrediting a process—which we know works, which provides evidence and sends a fingerprint which provides evidence to the court of law...since the turn of the

> century before last—why would we invest in that when it is not challenged? We don't have enough money to investigate properly!" **[R09]**.

Notwithstanding, the participant acknowledged the importance of accreditation, but was frustrated with meeting regulatory requirements because of the lack of sufficient funding:

> "[The accreditation] is supposed to make sure that everybody is doing it in the appropriate way, which is really laudable. But there is no extra money to pay for it! There are no extra resources to help you get there, there is nothing! I genuinely don't know how everybody thinks that we [police forces] can afford to carry on doing it because there is no government money to help you with those things." **[R09]**.

6.1.3.2 There is "pressure to cut corners"

It was found that because police forces are underfunded, the provision of forensic science services is predominantly driven by price-sensitive decisions and practices. The majority of the participants complained that instead of a holistic approach towards forensic science service provision, there has become "*cheap and cheerful*" ways of doing forensic science. This was explained by both private providers and police participants, who thought that because of competition and cheaper prices, "*people aren't looking at the proactive, forward-looking ways of doing things*." Thus, it was found that not only are evidence submissions for forensic analysis being rationalised by police forces but also the prices of services commissioned from private providers are being driven down through procurement strategies. In response to this, private providers also felt the "*pressure to do [analysis] more quickly and cut corners*." Thus, the participants from private FSPs emphasised that cheaper prices impact negatively on the quality of services. A participant from a large-scale FSP shared the experience below:

> "...the quality of the work provided needs to be at least a high priority, if not higher, than the price. But because the tenders are weighted, sometimes the price weighting is higher than the quality." **[R02]**

Another critical problem with financial constraints was the sustainability of private forensic science providers, including uncertainties regarding job stability and the loss of forensic science expertise. Another participant from a large-scale private provider explained how private providers' investments in achieving the Regulator's quality standards are being short-changed by the pressure from police forces. Because of financial pressures, the participant explained that it a "*requirement*" for private providers to produce forensic science at cheaper prices:

> "…at the same time as the price is becoming important and the requirement for us to deliver things potentially cheaper, there is still being a requirement to maintain that same level of quality [and] the same standards that are needed. And from there what does that actually mean? It means that we are investing exactly the same amount of time, efforts and resources

> into achieving the quality standards… But we are not seeing the same value in the marketplace in the way of return for the investment that we are making!" **[R13]**.

The small-scale specialist providers also experienced the negative implications of police forces' demands for them to provide forensic services more cheaply and quickly. Some complaints included 'shortcut' routes of forensic evidence submission, where items of evidence are submitted for analysis without any attendant investigative strategy. While a small-scale participant experienced that "*the procurement process and the authorisation process introduce delays that limit the amount of time to work on cases*" **[R04]**, another also experienced that 'shortcuts' counter-intuitively make the evidence analysis "*very long-winded and not at all efficient*." **[R07]**. This second participant shared experiences from giving evidence in courts, that the quality of forensic science is "plummeting" because police forces and the court are not using forensic science at its best. The participant complained that even though "*there is a huge, huge difference between the two, a lot of work is being commissioned for investigative purposes by police forces, but they try and use it for evidential purposes in court*". **[R07]**. In the extract below, the participant admitted to some extent the rationalisation of evidence submission due to financial reasons, but was worried about the implications on the quality and the reliability of forensic evidence in courts:

> "I mean, [the shortcut] is a good idea, maybe that person then gets arrested and pleads guilty, full stop, all done, very cheaply, very quickly! But of course, often that doesn't happen. The person will say 'I don't understand this, it can't be right, I am not guilty!' And you then spend months and months trying to put the jigsaw back together of how many items the police have sent for DNA". **[R07]**.

6.1.3.3 Decline in forensic science

It was explained that the quality assurance for forensic science is being impaired by underlying challenges within the forensic science sector where the Regulator operates. Some of the participants thought that defects with the FSR model are indicative of systemic flaws across the entire forensic science sector. As a result, some participants thought that non-compliance with accreditation deadlines by police forces even, though is problematic, "*is at the bottom of the list*" of the pressing issues facing forensic science. Rather, the participants believed that the biggest issue for forensic science is "*the decline in forensic science*" originating from commercialisation and cuts to police spending on forensic science. For instance, an independent practitioner referred to the problems of quality forensic science as the itemisation of forensic science analysis due to marketisation. In the extract below, the participant complained about the loss of forensic science expertise and the inappropriate use and commissioning of forensic science by police forces. The participant thought that these problems deprive the CJS of quality forensic science. However, relating to the role of the Regulator, the participant thought that these problems cannot be addressed by regulation.

> "[The Regulator] has got big fish to fry that she is trying to deal with...the entire industry is on its knees! So, the [decreasing] number of cases that are being examined;... how the police are tendering their work which means that big contracts are won and lost; so, there is a reduction of staff; staff being moved from one company to another every three years, every time that happens, you lose loads of experience…To me, that's a bigger problem for justice than non-compliance... **[R01]**

Another independent practitioner attributed the challenges of quality forensic science to the lack of consistent approach, reduced collaboration and communication in forensic service provision both within and between police forensic laboratories and private providers. In the extract below, the participant compared how collaboration and consistency used to be the norm within the FSS era and attributed lapses in the current era to the commercialisation of forensic science. These, the participant was worried that there is "*no solution at the minute*" by the Regulator:

> "In the old days...the FSS used to have inter-laboratory committees. Every lab had a committee to look at [different forensic science specialties], and the specialists will come together from all laboratories to see what the best techniques are, what is the range of techniques, how can we improve this, what do we need to research next... But now we have got over forty police forces and even though they combine in regions, they still have their own ways of doing things... So that doesn't help with consistency, that doesn't help to get the best practice. They are not working together to get the best. On the commercial side, if I found a technique that could be commercially viable and make my company a lot of money, I am not going to share that with you." **[R03]**.

A police participant shared similar sentiments about the decline in forensic science due to financial difficulties and the associated pressures and thought that while these affect the quality of forensic science, the challenges cannot be addressed with regulation:

> "…no amount of regulation is going to make any difference to what the individuals in the lab, who are under huge pressures to get as much work done as possible with the least amount of cash, are doing. It is a flawed system!" **[R09]**.

Some participants also thought that even if statutory powers are given to the Regulator, this will be ineffective because of the fundamental challenges within the sector. In the extract below, an independent practitioner, even though was supportive of both the FSR role and statutory powers for the Regulator, thought that the effectiveness of statutory powers for the Regulator is not a given until the challenges within the forensic science sector are sorted out first:

> "…if the Regulator is firefighting [then] you know that the system is terribly flawed. Because at no point in having a focal point—like the Regulator should be, [or], aspires to be—if the system that is regulating is so engineered to be flawed, that, it will keep throwing up problem after problem! It is absolutely right we need the Regulator; it is absolutely right that they should have statutory powers; it is absolutely right that they should be able to wield the big stick. But the system needs to be sorted out first… **[R08]**.

6.2 Research question two: To what extent have regulatory requirements and interventions impacted the quality of the work of forensic science providers?

The following sections capture the experiences of participants about how the regulator's programme of work has impacted on the quality of the work of FSPs. These comprise experiences of both positive changes and/or improvement(s) in practice and behaviour of FSPs and negative impact(s) of regulation. The importance of this evidence of regulatory impact was reiterated by a participant from a small-scale specialist provider who had also served on one of the Regulators' Specialist Groups. The participant observed that the Regulators issue "far too much" in terms of quality standard documents and was worried about the lack of knowledge about the effectiveness of these quality standard documents. The participant's response in the extract below, therefore, adds weight to the justification for this study.

> **Question**: Do you see the regulation trying to do something to influence some actions from service providers?
>
> "…One of my concerns [in the Specialist group] was that actually the Regulators issue far too much guidance and that means that people [forensic science providers] can sit back and wait to be told what to do… What somebody needs to do is to measure the effectiveness of those documents, and I don't think that has ever been done!" **[R04]**.

6.2.1 Positive impact on practice: Increased confidence in forensic practice

6.2.1.1 Enhanced review of forensic science testing and results

The majority of the laboratory participants attributed an improved review of forensic science testing and results to the FSR requirement for individual FSPs to have methods for checking and reviewing their forensic test and analytical results. The majority of participants stated having put in place a dip sampling procedure, which is a peer-review method. Participants experienced that dip sampling has added another layer of quality check for their test and analytical results. A participant from a large-scale private FSP described the procedure for dip-sampling, stating that that is the process where "little mistakes" are often identified in their laboratory. This is evidenced in the extract below:

> "So, we dip review a percentage of our work that goes out, a minimum of 5%, sometimes 10%. That means we pull the casefiles out and then we review them from top to bottom to see if there are any mistakes in them and then we trend anything that we find…and that's where we quite often pick up little mistakes." **[R02]**.

The police participants also experienced some common benefits of dip-sampling, especially at their fingerprint bureaux. All police participants indicated that methods for quality checks for fingerprint

comparison "*had long been established*" across fingerprint bureaux through national police training programmes. However, they highlighted gaps in this conventional method of quality checking. Firstly, it was stated that different police forces have had different procedures for quality checking, indicating a lack of consistency in procedures for quality checks in fingerprint bureaux. Also, it was found that the conventional method did not include checks and review for fingerprint comparison when there was a non-matching result. However, following accreditation of their fingerprint bureaux to the FSR Codes, the majority of the four police participants experienced improved and consistent quality checking practice. In the extract below, a participant indicated the lapse in the conventional method of quality checks in their fingerprint works and stated the improvement following accreditation. The improvement was that dip-sampling is ensuring that "*nothing has been missed*" during fingerprint comparisons, indicating that laboratories are confident with the results of their fingerprint comparison.

> "…the fingerprint side has always had strict guidance…There has always been like a triple checking process… [But] we didn't have things like dip-sampling of work in place. That's come in in recent years. At one time the only work that was checked was making sure that if someone matched a fingerprint, that that was definitely correct. If someone didn't match a fingerprint, we didn't have any good checking procedures to make sure nothing has been missed. So that wasn't so good prior to the accreditation. Now we have had to put a lot more work in around that, making sure that we are doing everything right." **[R11]**.

6.2.1.2 Increasing consistency and transparency in forensic practice

It was found that through accreditation, the FSR role is increasing consistency and transparency in quality assurance practices across both police forces and private providers. Within individual FSPs, consistent laboratory practices were attributed to the documentation of laboratory methods, processes and procedures. For instance, a police participant whose laboratory was recently accredited to the FSR Codes emphasised that "*certainly, for the areas [we are] accredited, documentation of procedures and processes has assisted in maintaining a consistent approach across a team so that all staff do everything the way they should*". **[R11]**.

Across police forces and private providers, participants also talked about transparency in test results, because of common peer-review methods and monitoring of staff competency. A participant from a private large-scale FSP explained that because "*everything [we] do is peer-reviewed, test results and conclusions are not just one person's opinion; somebody else also has to look at [the results] and…agree with that!* ***[R02]***. The police participants also stated that because of accreditation, their processes for quality checking in fingerprint bureaux have become "*more streamlined*" and have "*taken away*" pressures on cognitive bias. A particular emphasis was mentioned about fingerprint bureaux conducting blind peer-review as part of accreditation to the

FSR Codes. In the extract below, the participant emphasised that blind peer-reviews have addressed a "*bullying culture*" within fingerprint bureaux. The participant, who is a Director of a police regional forensic science collaboration, explained bullying culture as a form of cognitive bias which was "*prominent*" in fingerprint bureaux. However, the participant stated that the Regulator's cognitive bias guidance has been "*up and open and honest*" about transparency during fingerprint identification and verification processes.

> "There was a bit of a bullying culture, as in, someone would find identification and tell you about it and pass it for peer review, and seniors could do that to lower rank members of staff. So, there was that pressure that all of us signed up to it. Whereas now, it is an organised process; it is blind; you don't know who has made the identification; we have put a blind test in there." **[R17]**.

In repeated responses, some police participants also shared the benefits of common annual competency testing and error training analysis for staff in their forensic science laboratories. The Director of a police regional forensic science collaboration experienced that these practices "*had been neglected for a long time*" in policing but have been "*picked up by regulation*" and have become "*common practices*" across police forces. Through annual competency testing, which is also monitored by accreditation, the police participants stated that they can now monitor the competency of staff. A participant emphasised that annual competency testing has "*taken out passcode lottery*" from fingerprint bureaux. The "*passcode lottery*" was explained as "*similar to passing a driving test, where fingerprint examiners pass their expertise and never get retested*." **[R17]**.

A police participant credited competency testing and the maintenance of a consistent approach across a team to the impact of regulation and stressed that "*in the areas that they are accredited, accreditation has had an impact in improving the service that [they] deliver*." **[R11]**. However, a Director of a police forensic science laboratory, whose fingerprint bureau was yet to be accredited, was unhappy about mandatory accreditation for fingerprint bureaux. For the cost of accreditation, this participant described mandatory accreditation as "*just imposing a regulatory standard on something that is clearly working quite efficiently*." **[R09]**. The participant argued that fingerprint bureaux have provided fingerprint evidence that "*have been largely unchallenged for over a century*" and have gained trust in courts. As a result, in the extract below, the participant saw accreditation for fingerprint bureaux as a drain of resources that will not make any changes to the work of fingerprint bureaux:

> "What we do in the fingerprint bureau is the same as people have always done. You compare finger-mark and you say that 'it belongs to that person, or it belongs to this person or it doesn't belong to any of the people we have looked at'. Having that stamped [by

> accreditation] to say 'yeah they did that well' is a drain on resources. It doesn't actually make a change to the way we do it! **[R09]**.

6.2.1.3 Increased robustness of methods and traceability of analysis

It was found that because of the validation of forensic science methods, laboratory participants have seen increased confidence in their test results. This was based on participants' experiences that validation is increasing the robustness of their forensic science methods. The participants stated that they are confident in their forensic science testing results because they can support conclusions drawn from test results with "lots of data and background materials". A participant emphasised the importance of this that "*it means that when you are doing analysis, everything is traceable and provable*." ***[R02]***.

Notwithstanding, all the participants experienced challenges with their validation process. Sharing experience from working as a quality assurance manager both for a police laboratory and a private large-scale FSPs, a participant offered a general experience that validation is "*far easier*" for FSPs who have held accreditation for ISO 17025 for a long time than those who have not and experiencing the FSR Codes of practice for the first time. In the extract below, a police participant whose laboratory had recently been accredited illuminated this experience and described the challenges of validation as the "*negative side*" of accreditation.

> "...the negative impact of accreditation is that it is very resource-intensive; so, it has made us very bureaucratic and slowed us down quite a bit." **[R11]**.

A participant from a private small-scale FSP also acknowledged similar challenges of validation because of the "*amount of work*" that goes into it. However, after comparing the level of confidence before and after validation and seeing an increase post-validation, the participant "*welcomed*" the challenges of validation. In the extract below, the participant explained that even though they were confident in their test results without validation of methods, the validation process revealed that their confidence was "*misplaced*".

> "Validation has increased my confidence unknowingly. I thought I was confident before. I now know that my confidence was potentially misplaced… It is a bit like if you are in court and somebody asks you a difficult question and I say 'Oh, I haven't thought about that!' And, with the sort of things that the Regulator is requiring me to do right about validation, it is about improving the quality of everything I do. And I welcome that; it is hard, but I welcome it" **[R15]**.

6.2.1.4 Service providers have policies for handling quality failures

When it comes to reporting of cases of quality failures, all laboratory participants emphasised that they do or will report cases to the Regulator based on the circumstances of cases, whether they are high, medium or low risk. Participants from both private and police laboratories stated that they have policies in place to handle quality failures. The individual policies were common for their classification of cases, based on the severity of (perceived) risks. In the extract below, a police participant stated that until recently being accredited, they did not have the policies within their system for handling quality failures to report cases to the Regulator. However, after accreditation, the participant stated that procedures have been put in place to ensure that if there is a "*major problem*", that will be referred to the Regulators.

> "Well, when we have been assessed in recent years, these are issues that UKAS has raised with us, that, until recently we hadn't written in our processes that if there is a major problem, we will refer it to the Regulator. So, we didn't have that written into our processes originally, but we have now. So that is something that we have written in recently…" **[R11]**.

In addition, the laboratory participants responded in common that when quality failures are identified, they do or will investigate cases, firstly, to understand the impact, and, secondly, to determine whether to inform the Regulator. In the extract below, a police participant put in the context both the obligation to report cases of quality failures and the need to investigate cases to understand the impact before referring cases to the Regulator. The participant repeatedly stated that they agree with regulatory requirements to report cases of quality failures that have an impact on the wider forensic science community.

> "…the Regulators expect that things are escalated to them, where they are significant and high-risk that can affect public confidence in forensic science and can have wider implications across. I don't really have an issue with that [but] I don't escalate cases immediately…If somebody comes to me with something that has happened, I wouldn't immediately escalate it. I would do an investigation to understand the impact before escalating…I don't think that the Regulators expect that we escalate everything to them. But I understand and I sort of agree that if there is a risk to the wider forensic science community because something has happened [then we have to report]." **[R14]**.

Different explanations were given about the nature of high-risk cases that should be reported to the Regulator. Some independent practitioners thought that there is a lack of clarity in terms of the nature of these cases. However, a participant from a private large-scale FSP stated that the requirement for case reporting is clear in the Regulators Codes of Practice. The common explanation by the laboratory participants was that high-risk cases are those that can have a negative impact on the outcome of cases in court. For instance, some police participants stated that for their fingerprint analysis and comparison works, a high-risk case will be where examiners "*wrongly*

identify a suspect." Some private laboratory participants also shared common explanations that a high-risk case will be "*any incorrect result that is released to the customer and it causes a significant issue*". In the extract below, a participant from a private large-scale FSP gave an illustration of such case instances and stated that this has not happened in their practice. Notwithstanding, the participant expressed an intent that if they identify "*serious*" cases that could impact results that had already gone to court, they will report them to the Regulators.

> "A quality-related issue will be where if we produce a result that is wrong, or we reported an outcome that was wrong…If we spotted something serious that could impact on results that had already gone into court…we would raise that ourselves with the regulator and say we found this. That has not ever happened to us, I have to say, but if we did, we would…" **[R02]**.

6.2.1.5 Service providers are confident to handle 'low-risk' quality failures

The majority of laboratory participants stated that they have not found high-risk cases in their work, as yet that should have been referred to the Regulator. However, all of them stated that they have had low-risk cases, which some participants referred to as minor non-conforming works. The participants were confident to deal with these cases and attributed their confidence to having robust quality management systems, as part of maintaining accredited systems. In the extract below, a participant from private large-scale FSP provided an instance of minor non-conforming work and explained why this will be dealt with internally by their laboratory:

> "If there was anything within our system where the systems were not being followed, then if it was to a minor level, then, that's something we [will deal with it] in-house because we review our work all the time." **[R02]**.

Some laboratory participants also explained internal investigations of minor quality failures as a means to prove the robustness of their quality management systems. A police participant stressed this by saying that "*that is the whole point of the quality management system, to show that you have got the ability once you have spotted and identified that something might have gone wrong, and a means to investigate it and deal with it."* **[R14]**. In the extract below, another participant from a large-scale private laboratory experienced that in-house investigation of minor non-conforming works provide the opportunity for their laboratory to put actions in place to correct mistakes. As a result, the participant stated that internal investigations of minor non-conforming works do offer outcome to their forensic practice. The participant, then, stated that they do inform the Regulator not only about cases of quality failures but also the corrective actions which are taken by their laboratory. By doing that, the participant explained that

> "…you give yourself the opportunity for an independent inspection to ratify that what you have undertaken in way of investigation and corrective and preventive actions is proved strong. It gives you the room to be able to manoeuvre forward, gives you the opportunity to improve and will ensure that that issue cannot happen again. So, …there is an outcome to [internal investigation]. **[R13]**.

6.2.1.6 FSPs apply regulatory requirements to mitigate risks

As lapses in the scope of accreditation were found in the practice of some small-scale providers and police forces, it was found that these providers, nevertheless, adhere to other regulatory requirements to make up for gaps in quality assurance. The participants acknowledged in their practice that in areas where accreditation is required but has not yet been obtained, this can be used as counterargument by opponents in court. As a result, the participants stated that when non-accredited methods are used for service provision, they comply with the FSR requirements to include a declaration of non-compliance with accreditation in their expert report to the court. The police participants emphasised doing this for some in-house digital forensic works, as a full scope of accreditation has not yet been achieved.

A police participant disclosed doing this for some services they procured from private service providers who had not been accredited for their methods. In the extract below, the participant gave an instance of declaring non-compliance with accreditation for toxicology services they procured from external private providers. The participant explained that even though the private provider was non-accredited for their methods, they continued to use them for supply because the capacity for that forensic service (drug driving test) was low in the forensic science marketplace:

> "So, the lab that we use for our toxicology, for a long time, was not accredited for drug driving because it took them so long to get a visit from UKAS. But where else would we send it? So, we just carried on using them and they wrote on the statement, 'we are not accredited for these, but we are working towards it'. Nobody challenged it, it was all kind of fine." **[R09]**.

In the extract below, another police participant also gave an instance they had to cease in-house provision of DNA services because they were lacking accreditation and could not meet accreditation deadlines. "*But for the need for quality*", the participant stated that all DNA services were outsourced to external suppliers until accreditation was obtained for in-house service provision:

> "…the first area we looked at [for accreditation] was fingerprint enhancement laboratory and we got that in time for the deadline. We didn't get the DNA clean room in time for the deadline and so we outsourced all our work for almost a year before we actually accredited that laboratory." **[R11]**.

The participants from small-scale FSPs also stated that they comply with the Regulator's Code of Conduct and the Criminal Procedure Rules. From experiences as expert witnesses in court, some participants admitted that they declare non-accreditation for some digital forensics in their experts' reports and this "*has not been an issue, yet*" in the courts they have appeared. Notwithstanding, all the participants disclosed that they are asked about their experiences and qualifications. A participant shared the following experience:

> "I usually appear in court once or twice a month and [the court] never ask about accreditation at all. They never ask about the Regulator. It doesn't come up. And none of the people issuing instructions to me asks about it." **[R04]**.

While a participant stated that they use the Criminal Procedure Rules as a "*quality control measure*" and a guideline in their practice to ensure their expert reports meet admissibility requirements, another also disclosed adherence with the Regulator's Code of Conduct. In the extract below, the second participant stated that as the Regulators do not require expert witnesses to be accredited for the Code of Conduct, writing a declaration of compliance with the Code of Conduct suffices adherence to regulation:

> "Often, I am asked about my qualifications and my experience. So, I am establishing my own credentials. I am not doing it by saying 'I have just got UKAS accreditation'…I do put a declaration in my statement that I do comply with the Regulator's Codes of Conduct and, at the moment, those Codes do not say that I must be accredited... So as far as I am concerned, I am complying [with regulation], and I do declare it." **[R07]**.

6.2.2 Negative impact: Less focus on building in continuous improvement

6.2.2.1 Unequal transparency in reporting quality failures

Some participants, especially the independent practitioners, criticised the approach of reporting quality failures that it is unequal between police forces and private providers. This was based on participants' experiences of some previous high-profile cases which were reported by some private FSPs. As a result, most of the participants, including those from private FSPs commended private providers in general for being upfront in reporting high-risk cases of quality failures. However, some participants compared the reporting of cases of quality failures between private FSPs and police forces and expressed dissatisfaction for police forces in general. It was also speculated that police forces are under-reporting cases of quality failures. In the extract below, an independent practitioner described the situation with police forces as a "*worry*":

> "If you go back, there was a couple of times some private providers made mistakes and became public and they became upfront about it. The police are not so good at doing that. It is a worry!" **[R02]**.

In the extract below, an independent practitioner affiliated with police forces speculated that there is a high likelihood for police laboratories to report fewer cases of quality failures because "*the police service is such a different organisation*". The participant referred to the strict organisational culture of police forces, in general, and thought that this might restrain police forensic science laboratories from reporting cases of quality failures:

> "I think there is probably less focus amongst the external [private] providers to not to disclose [quality failures]. But I think within the police service because the police service is such a different organisation, there is the culture of 'if I admit to this [error] I am going to be in trouble'. So, there is more chance of [non-reporting] happening there. I have no data to expand on that, but I suspect that that is the case." **[R18]**.

A police participant admitted some challenges with identifying and reporting cases of quality failures to the Regulator. The participant attributed challenges to the reduced number of evidential materials being submitted for analysis in forensic laboratories and the lack of adequate feedback mechanism between police forces and the courts. For the latter, the participant explained that if there are problems with the quality of forensic evidence in courts, it is difficult for police forces to track and identify instances of quality failures. In the extract below, the participant elaborated on this challenge:

> *"*So, if I can only send-off three swabs out of six [to the private lab] and the other three swabs would have given me a different suspect, but that person that we have sent off DNA materials for is convicted, how do I know it is wrong?... How would the [private] lab know it is wrong...The person who is being convicted might be saying 'it is wrong, it is wrong'; but how would we ever know it is wrong?" **[R09]**.

6.2.2.2 Blame culture threatens transparency and lessons learning

All participants were asked to share experiences and perceptions about any impediments or limitations in reporting cases of quality failures to the Regulators. An independent practitioner thought there should not be any impediments for FSPs to report cases of quality failures because "*the ramifications of that are just so great that if a mistake is made,…[it] gets no better at all if you try to cover things up or you don't disclose it".* **[R18]**. However, most of the participants observed some challenges and limitations. It was found that potential conflicts of interests and a "blame culture" pose difficulties to both transparencies in reporting cases and learning lessons for continuous improvement. The participants indicated that with or without enforcement powers for the Regulator, FSPs do, or will report cases of quality failures to the Regulators from goodwill and good organisational culture. For instance, most participants thought that reporting quality failures is dependent on having both trained and ethical scientists in laboratories, and a good working relationship between individual practitioners and those in charge of handling quality failures.

As a challenge to reporting quality failures, concerns were raised about "*blame culture*" and "*bad publicity*" from quality failures. An independent practitioner stated that "*it is not easy*" for FSPs to report cases of quality failures because "*it makes them look bad*". Referring to past publicised cases of quality failures, the participant commended the FSPs who were involved and stated that *"it is a big step for large public and private sector organisations to be willing to, up to a point, air their dirty washing in public."* ***[R05]***.

Much emphasis about blame culture was linked to the behaviour of individual laboratories. In the extract below, a participant from a private large-scale FSP admitted that people are less likely to report quality failures if there is a "blame culture" within forensic science laboratories:

> "[Reporting cases of quality failures] is a difficult one. I suppose the difficulty with it is, I'm not sure it's down to the Regulator; I think it is to do with the blame culture. If you have a blame culture then people are less likely to highlight their own inadequacies, basically… I think in a good forensic science lab, there should be an open, no-blame culture so that people are happy to… raise concerns and queries" **[R02]**.

Some participants expressed concerns about the commercial implications for private FSPs who report cases of quality failures. For the business approach of private FSPs, it was thought that there is a potential conflict of interest with reporting cases of quality failures. It was highlighted that reporting cases of quality failures have a detrimental effect on the business approach and reputation of FSPs. For these implications, an independent practitioner cited a conflict of interest that private FSPs "*can either go for outright concealment of quality failures because of the threat to business*" or "*can choose to report quality failures to learn lessons for continuous improvement*." Speculation for the former was higher as participants indicated that organisational culture for quality differs from one FSP to another. Some participants also thought that the market relationship between private FSPs and police forces could make it difficult for private FSPs to report quality failures about their police customers. This was explained as below:

> "...The Regulators are relying on the goodwill and cultural values within an organisation to whether they will report failings or not. And, typically, the culture will be very different between one organisation and another. Some might take the responsibility and take this very seriously to correct gaps that cut corners whereas others may not...and would potentially see whistleblowing as a risk and a threat to them in their reporting rather than as a means for continuous improvement for the criminal justice system, and especially, if their customer, the police force, is the one they are whistleblowing about." **[R08]**.

Another independent practitioner stated that there is a blame culture within the wider community of forensic science providers, where individual practitioners are more likely to be criticised for quality failures rather than criticising weaknesses in systems that should safeguard quality failures.

For this culture, the participant thought that police forces and private providers are likely to "*sweep things under the carpet*". The participant stated that as reporting of quality failures can cause private FSPs to lose business, police forces can also lose public confidence and reputation for reporting quality failures. This participant's opinions were captured as below:

> "I think it's a fair comment that people would like to sweep things under the carpet… They don't want to lose business because of a scandal or cause a loss of public confidence, …even if it's a public organisation—a police service…because it just makes them look bad… [And] part of this idea of things being swept under the carpet is that in that kind of introspective and somewhat paranoid culture, people want to find somebody to blame and want to point fingers and say 'it's you, it's your fault' rather than saying 'it's us, it's our system'..." **[R05]**.

6.2.2.3 Variation in forensic methods and techniques

It was found that FSPs adopt the Regulators' quality standards through individual approaches, where they develop their own methods and procedures for forensic science testing and analysis, and policy documentation to conform to the required standards. Some independent practitioners criticised these individual approaches and attributed it to the lack of regulatory guidance on the appropriate techniques, methods and procedures that FSPs should use to conform to the relevant quality standards. As a result, it was explained that different methods and procedures for forensic testing and analysis co-exist between individual FSPs and across the wider landscape of FSPs. It was stated that this causes variations in terms of how forensic science testing, analysis and activities are carried out across the board of FSPs. In the extract below, an independent practitioner put this in the context that different FSPs who provide the same forensic science service can use different methods and procedures, both of which can be accredited:

> "… one of the criteria of the standards is to have your procedures written down. So, if you have two labs, both of whom are doing forensic fibre examinations, for example, they could be doing fibre examination in completely different ways, but as long as they have the procedures written down and they follow it...then they meet the standards. The standard is just kind of silent as to how things should be done." **[R08]**.

However, opinions differed in terms of how variation in testing methods and procedures affect the quality of the work output of FSPs. Some laboratory participants argued that different forensic science testing methods and procedures for the same evidence type should not be problematic if they produce the same analytical results. Further, the participants stated that accreditation assessment by UKAS provides assurance that the methods and procedures by individual FSPs are unbiased.

However, some independent practitioners explained that having different methods and procedures for testing and analysing same evidence types across the different FSPs or for carrying out a specific task, such as peer-reviews means that there is lack of understanding of "*best practice*". It was stated that this makes it difficult for the courts to understand forensic science. An participant emphasised the effect of this, saying that "*the court is not necessarily getting the best information to help them make their decision on guilt or innocence*." ***[R03]***. Again, it was stated that FSPs experience unequal cost, efficiency and timeliness in accrediting their individual methods and procedures, because of the different ways of conforming to the same quality standard requirements. In the extract below, a participant described the impact of regulation, then, as "*double-edged*". On one side, the participant commended regulation for establishing a single set of quality standards for forensic science service provision. However, variation in conforming to these standards and the unequal benefits and challenges for different FSPs were described as the downside of regulation.

> "On the positive side, the Regulators set standards that everybody tries to work to…The other side of the coin is really quite interesting, in terms of those having the standards, does that mean that they have got the best science and the best techniques? And, unfortunately, the answer to that is no! Private forensic science providers can go and get the [Regulators'] standards, the police forces can go and get the standards, but they can all do it in different ways. We don't know which [procedure] is the most efficient: some will be more expensive; some will be timelier. **[R03]**.

6.2.2.4 Individual approaches to validation of methods can be discriminatory

Most participants agreed that validation of forensic science methods, "*if done right*", should ensure that error limits of forensic methods are known, and this should help reduce or mitigate errors when these methods are used in casework. However, some participants cited limitations by individual FSPs validating their methods. Concerns were raised about validation requirements where individual FSPs validate their methods against 'end-user requirements'. It was stated that individual FSPs identify their end-user requirements by determining the intended products and results that their methods will deliver to customers. However, some independent practitioners and participants from small-scale providers opined that individual FSPs wrongly interpret the end-user requirements. It was stated that even though FSPs are expected to serve the CJS—as the end-user—this is "*almost utopian*" because individual FSPs consider themselves as either providing services for prosecution or defence purposes. An independent practitioner explained that because of this division, "*a lot of forensic science providers never really see things from a different point of view*". This was explained as below:

> "... [forensic science providers] are meant to be serving to the court... I don't doubt that most forensic scientists try to that as best they can, but a lot of them only ever do

> prosecution work [or] they work for organisations that only ever do a prosecution work; they never really see things from a different point of view." **[R05]**.

An independent practitioner affiliated with police forces explained this problem from the policing perspective. The participant shared an experience from working with police forensic science laboratories that there is "*always*" a lack of consideration for the defence hypothesis by staff who work in police forensic laboratories:

> "I have done casework with [the police] and when I was doing that, I was always doing it exclusively with the prosecution hypothesis in mind. But who is looking at the defence? And if I am faced with overwhelming evidence, how do I commission my own defence expert, particularly when you couple that with the limitations for funding for Legal Aid?" **[R18]**.

From the wrong interpretation of end-user requirements, it was stated that validation of forensic science methods can, then, become discriminatory. A participant from a specialist small-scale FSP explained that individual FSPs can validate their methods to supply "*consistent results*" to meet one customer's needs. The participant explained that providing consistent results does not necessarily mean that the results are correct. In the extract below, the participant argued that UKAS accreditation badge for individual FSPs is a "*missed opportunity*". It was explained that because UKAS' accreditation does not check whether the methods and procedures of FSPs provide correct results, accreditation can make individual's methods "*look better than they are*". It was added that this also prevents FSPs from reviewing and improving their methods and procedures because they are already accredited.

> "...the way the regulations are written and the way UKAS is assessing them, if you give the customer what they say they want, and you do that consistently, then you can be accredited. There is nothing in there that says that the method must be correct! So, it doesn't help. You end up with a veneer of respectability and it may be that you have got some fundamentally bad, incorrect, unreliable methods but they are accredited. So, they [the methods can] look better than they are" **[R04]**.

6.2.2.5 Quality failures show complacency with accreditation

The relationship between regulation and prevention of quality failures in forensic science laboratories was found to be contentious. It was stated that even though the Regulator investigates quality failures and provide recommendations to help mitigate the recurrence of similar cases, "*it is very difficult, if not impossible, to stop odd rogue individuals from doing something wrong*" in forensic laboratories. An independent practitioner thought that "*it is naïve to think that regulation in itself is going to prevent scandals in forensic science"*. ***[R05]***. However, by referring to the

Randox scandal, most participants thought that quality failures show that there are gaps in regulation and complacency with quality standards and accreditation.

For instance, a participant from a private small-scale FSP acknowledged the work of UKAS in inspecting the methods and procedures of FSPs. However, the participant admitted that laboratories and practitioners are "*going to be on their best behaviour"* during accreditation assessment than when they are under pressure during casework. **[R07]**. The participant, then, stated that laboratories can have accredited methods and procedures, but ensuring that staff follow the methods and procedures during casework activities is "*a different kettle of fish*". **[R07]**. A police participant explained similarly that the problem with accreditation inspection is similar to the inspection of schools, that *"on the day when the assessors come to a school, everything looks great [but] it doesn't describe what happens at the rest of the year!"* **[R09]**. Another participant from a small-scale FSP illustrated this problem as similar to an MOT test on a car. The participant explained that:

> "The mechanism [of accreditation] that exists at the moment…is like an MOT test on a car. It is valid on the time it is issued. But the car could become completely unroadworthy as soon as it drives away from the test centre, but because it passed that test it can stay on the road for another twelve months. That refers to what the accreditation process is doing." [**R04].**

An independent practitioner stated that there is a "*belief*" that defence experts are a "*particular problem*" because their work is mostly not accredited. However, the participant argued that this cannot be supported with evidence because "*recent forensic science scandals in the UK, very often, have occurred in organisations that take the bulk of their work, if not all of it, from the prosecution and carry it to the recognised standards of the day"*. **[R05]**. The participant, then, stated that such comparison that non-accredited FSPs are more problematic than accredited FSPs is "*very complacent*". **[R05]**.

From another perspective, a participant from a private small-scale FSP thought that accreditation "*prevents people from looking closely at the work of accredited FSPs as they should have*." **[R04]**. Referring to the impact of quality-failures, where the number of affected cases increases because of failure to detect quality failures early, some participants explained that there are weaknesses in peer-review methods by FSPs. An independent practitioner attributed this to the individual approaches of demonstrating compliance with the requirements for peer-review methods, stating that different FSPs can be doing peer-reviews in different ways, without knowing which one is the best fit for purpose. **[R03]**.

An independent practitioner explained that the accreditation status granted to FSPs creates a false impression about the quality of services for which individual FSPs are accredited. The participant thought that accreditation misleads judges and lawyers into thinking that FSPs "*always*" provide quality forensic science services. However, the participant explained that two different laboratories accredited to the same standards to provide the same service could provide services of different quality. This was captured as below:

> "I think it is important for the criminal justice system to know that [forensic science] methods have been assessed by an independent body. But I think what is wrong is that it produces an impression for people outside the industry who don't understand in detail what it means. The impression is that because you have accreditation that you are a really good laboratory and up to the task; whereas, in fact, you... could have two laboratories with the same standards providing on paper the same service, but actually the quality of the service that they provide could be very different." **[R08]**.

6.2.2.6 Regulation prioritises accreditation over improvement in practice

Some participants raised concerns that quality standards and accreditation are being sought after for consistent practices within FSPs rather than helping to improve the methods and techniques of FSPs. It was repeatedly explained that accreditation is "*just*" assessing that forensic science providers conform to the Regulator's standards, indicating that accreditation was insufficient in demonstrating that the methods and procedures are fit for their specific forensic purpose. For instance, a laboratory participant explained that UKAS only inspects the methods and procedures, which is similar to writing down a recipe to cook for someone then inspecting that you follow it. This was captured as below:

> "...in terms of the quality of the work that we produce, all accreditation does is to demonstrate that the methods that we are performing are as we have stated in the standard operating procedures. So, it is almost like writing a recipe down to cook and you follow the recipe... UKAS is not there to tell you what and how to do it [the analysis]." **[R01]**.

Some participants raised concerns about the lack of input by both UKAS and the Regulators in helping FSPs to develop and improve their forensic science methods and techniques. A participant from small-scale FSP blamed the Regulator for only asking FSPs to implement quality standards rather than partnering with and asking FSPs on how regulation can help improve the quality of their practice. The participant stated that "*the Regulators need to go back to the forensic science providers and actually ask them on how to improve*." **[R04]**. A police participant shared a similar experience and stated that since accreditation assessment occurs once in a four-year cycle, checking that forensic science providers "*do what they say they do*", the accreditation assessment is "*somewhat artificial*". This was explained as below:

> "If there were some ways that [the FSR and UKAS] could come in and say, 'hey, we have got this marvellous improvement, this is how we think that everybody should be doing [this technique]', then, obviously, that would be great! But that doesn't happen and that is not the point of it. The point is just to come around and check that you do what you say you do. But because that assessment happens in a cycle, usually over a four-year period with a visit after two, then it's somewhat artificial." **[R09]**.

A participant from a small-scale provider opined that because of competition for service supply at the forensic science marketplace, some FSPs are seeking accreditation for "*competitive advantage*". The participant stated that "*if [people] have the badge that says they are accredited; they think they are more likely to get the contracts than someone who isn't*." **[R04]**. A participant from a private large-scale FSP admitted the requirement for accreditation in contract bidding but discounted that as the only motivation for accreditation. The participant stated that "*it is not just about winning the work; it is about having a quality culture in the organisation because that actually spreads a lot further." [R13]*.

6.2.2.7 Compliance with regulation is "really, really expensive"

It was found that compliance with regulatory requirements is expensive across all levels of FSPs. The laboratory participants explained that the cost of complying with regulation comprises the financial cost of UKAS' assessment, internal cost of methods validation, maintenance cost for systems and equipment, and cost of research to develop methods and procedures. While a participant from a private large-scale FSP described these costs as "*unsighted*", the majority of FSPs stated that they are unable to meet regulatory requirements because of financial difficulties. In the extract below, a participant from a private small-scale FSP complained about the amount of validation that FSPs are expected to do and the associated cost:

> "The amount of validation that one is expected to do adds an enormous cost. I don't have that money and, yet, I still have to find that money somehow. It is really, really expensive! You could not only do what [the Regulator] requires, you have to spend tens of thousands of Pounds on accreditation and tens of thousands of Pounds on the maintenance of equipment." **[R15].**

The police participants emphasised the cost and resource intensiveness of accreditation and validation processes as limitations for meeting regulatory requirements on time. A participant stated that the cost of accreditation puts a "*huge strain*" on all police forces because "*police forces, up and down the country, are not equipped and resourced in the right way to deal with accreditation*". **[R14]**. In the extract below, a police participant acknowledged the importance of accreditation. However, the participant was frustrated by the lack of sufficient funding to meet accreditation requirements:

> "[Accreditation] is supposed to make sure that everybody is doing it in the appropriate way, which is really laudable. But there is no extra money to pay for it! There are no extra resources to help you get there, there is nothing! I genuinely don't know how everybody thinks that we can afford to carry on doing it because there is no government money to help you with those things." **[R09]**.

An independent practitioner criticised police forces in general that "*having a good laboratory practice and accreditation is a given*", which should not only be achieved because of regulation. The participant stated that:

> "… of course, police forces will complain that the cost of accreditation is expensive, however, persistent failures by police forces to meet regulatory requirements, which have been in place for more than a decade, shows that they are just not fully embracing quality standards and are not on board with the ethos of quality." **[R03]**.

The large-sale private providers also complained about the cost of accreditation and validation. However, citing accreditation as a requirement to bid for forensic service contracts, a participant stated that "*the cost of accreditation is a massive consideration to bear in mind and to move with the tide [of the marketplace] anywhere it goes*." **[R13]**. In the extract below, another participant from a private small-scale service provider welcomed regulatory requirements for both accreditation and validation. However, the participant stated that not all FSPs could afford compliance with requirements because "it is really, really expensive".

> "What [the Regulator] is demanding is right and shouldn't be diluted, but I know people would want to dilute it because they will say 'we can't afford it'!" **[R15]**.

The cost of accreditation was found threatening to small-scale FSPs. One participant put the cost of accreditation in the context that "*it costs between £10,000 and £30,000, and for a small-scale specialist provider with a turnover of less than a £100,000 a year, that is a significant chunk of turnover that they just don't have."* **[R04]**. Another participant also stated that for the cost of accreditation, some small-scale digital forensic service providers and experts have switched from the forensic marketplace into other sectors where they can practice without necessarily needing ISO 17025 accreditation. While a participant stated they are near leaving the marketplace too, some also stated that because they could not afford accreditation, they are being selective in their service provision, by providing services for which accreditation is not required. Another participant explained that the decision to be selective in providing services as below:

> "I have just taken a decision not to offer certain services because those are the ones that the Regulator would require me to be accredited for and I cannot afford the accreditation. So, I have stopped providing those services. But I still do offer other services that are outside the scope of accreditation…" **[R04]**.

6.2.2.8 Regulatory requirements are excessive and rigid

A direct relationship was found between the cost of accreditation and the number of quality standard requirements that individual FSPs are expected to be accredited for. The majority of laboratory participants explained that the Regulator's quality standards are enormous. Particularly, small-scale participants stated that the quality standards are "*impossible to keep up with*". Some police participants also stated that requirements to achieve accreditation by timelines are rigid. A participant from a private large-scale FSP explained that the excessive-quality standards are a limitation to achieving accreditation on time because the Regulators "*continually layer standards upon other standards and further requirements, increasing the complexity to a greater level".* **[R13]**. Some police participants felt that in scheduling the deadlines for accreditation, the Regulators have not considered the operational duties of police forces. A police participant explained that in addition to individual police in-house forensic capabilities, different police forces have also got different operational priorities, with some police forces as national leads for specific criminal investigations. In the extract below, the participant shared frustrations that lack of flexibility prevents FSPs from being innovative in their service provision:

> "The Regulator sets the schedule [for accreditation] but there is no wiggle room for it at all. It is just 'here is your date, if you don't get it by that date, then you write at the bottom of your statement that this [analysis] was done in an unaccredited environment'—which potentially opens up a defence challenge… The Regulators have to allow for some flexibility for people to innovate and to be able to apply the appropriate forensic service to what they are doing. It is too rigid! Accreditation feels like how much you crack a nut!" **[R09]**.

The participants who had served on the Regulators' specialist groups experienced that the excessive-quality standards are both a "*limitation*" and a "*temptation*" by the Regulators because they are exclusively looking at "*scientific excellence*", without necessarily considering the cost that FSPs will incur for compliance. The need to justify the cost of compliance was emphasised by a participant who stated that *"the money spent on regulation is the money that has been taken out from frontline investigation by police forces and private forensic science providers*." **[R06]**. In the extract below, the participant recounted an experience from serving on one of the Regulator's specialist groups and complained about the lack of consideration for cost by members of the group:

> "I remember in the [specialist] group, I was saying that [the standards] are a little bit excessive and people would look at me as though I was in favour of stopping this. I wasn't, but I was in favour of not wasting money. I say that 'it is obviously going to cost money', and at that stage, people will come back to me and say that 'look, our job is excellence, funding is somebody else's'!" **[R06]**.

Another independent practitioner sympathised with FSPs about the cost of compliance, and was worried that it will not be surprising to note that FSPs "*are not achieving some benefits of regulation that are more than marginal, [because] the cost of complying with regulation is significant and counterproductive to service providers*." ***[R05]***.

Other laboratory participants also experienced that the cost of accreditation is partly due to the approach of UKAS' accreditation assessment. Some participants gave instances where they thought the cost of accreditation was "*unnecessarily expensive*" and incurred for something "*immaterial*". A small-scale participant recounted how only changing a brand of a multiplex short tandem repeat (STR) markers for DNA analysis to another brand with the same markers cost an accreditation visit of £8000. The participant complained that UKAS does not accredit "*generic things*" and they are unfair with the price they charge for accreditation. This was explained as below:

> "I think UKAS is an expensive accreditation body and I think that the quote they give me for the work that they do is high, but there is no competition there. I don't think they are fair. I wouldn't mind they are just being one body that we could go to if I thought it was fair. But it doesn't feel fair, put it that way!" **[R15]**.

Another police participant shared a similar frustration with UKAS' accreditation assessment. The participant stated that the UKAS assessors "*worry about things that are easy*" and, sometimes, give an unhelpful recommendation. The participant complained that invariably, some police forces have failed accreditation because the format of their laboratory Standard Operating Procedures (SOPs) did not comply with the way that UKAS wants to assess them, but not because the procedures were wrong or produce false results. The participant shared the following frustration:

> "I would give you an example of things that really get on my nerves. We have had recommendations from UKAS to change the font style on our SOPs. That is the kind of hopeful insights I get! I am not saying they never come up with something useful, but it is invariably an administrative change and the amount of work that goes into preparing for a visit to be told that we'd rather write it in a different font style, it is phenomenal and it costs £12,000 a visit." **[R09]**.

6.3 Research question three: What changes could the FSR Bill bring to the regulation and the quality of forensic science service provision?

6.3.1 Positive changes perceived of the FSR Bill

6.3.1.1 Statutory powers will give "more teeth" to the Regulators

The majority of participants supported statutory powers to mandate the FSR Codes of Practice and for the Regulator to issue compliance notices. The participants observed that gaps in compliance with accreditation by some FSPs are due to the voluntary nature of accreditation requirements. Participants were, therefore, hopeful that statutory enforcement powers will help the Regulator to level gaps in accreditation and improve consistency in quality assurance practices across all FSPs. A participant from a private large-scale FSP explained that without statutory enforcement powers, the Regulator's quality standards and requirements for accreditation "*lack meaning*". As a result, the participant believed that statutory enforcement powers will give "*a true urge and a true meaning*" for quality standards and accreditation. This was explained as below:

> "…the fact of the matter is that, if we are operating in an environment where quality standards, accreditation, and competence are co-criteria, there has to be a point where that becomes enforceable. So, if it is just there as words, it lacks meaning. However, if it becomes enforceable, that actually gives it a true urge and a true meaning..." **[R13]**.

An independent practitioner believed that statutory enforcement powers will give the Regulator *"more teeth to sanction organisations that were recalcitrant; they were slow in complying and behind deadlines, and persistently failed to fulfil the requirements"*. **[R05]**. However, the majority of participants were specific in pinpointing problems of non-compliance and gaps in accreditation being prevalent in police forces and some small-scale FSPs. On the other hand, it was stated that private large-scale FSPs are fully embracing regulation and accreditation. It was therefore emphasised that statutory enforcement powers will have a "*significant impact*" on police forces.

The majority of police participants agreed that deadlines for accreditation for some forensic science areas have been missed by police forces. A police participant attributed the root cause of the challenges with accreditation within policing to lack of understanding and support by senior police officers. As a result, the participant believed that statutory enforcement powers can change the mindset of police forces to see accreditation as "*something essential*" for forensic science service provision rather than as "*something nice to have*". This was captured below:

> "You don't have the same level of accreditation in anything else in policing…Most of the senior police have seen [accreditation] as overly bureaucratic and something that is quite unnecessary...So, there is something about [accreditation in police forces that], unless it is bound in legislation, people choose as maybe it is nice to have rather than as something essential." **[R14]**.

The police participants who supported statutory enforcement powers for the FSR role were inspired by the changes in the number of accredited fingerprint bureaux caused by the statutory accreditation for FSPs who provide fingerprint and DNA services. The participants were hopeful that similar statutory enforcement powers for the Regulator will drive a "*huge appetite"* for accreditation for other forensic science areas within policing. In the extract below, a police participant admitted that statutory enforcement powers may be the only way to get some police forces accredited, and to be quick with accreditation:

> "[statutory powers] are probably the only way you would get some police forces [to be accredited], and fingerprint is a classic example. [The Regulator] gave a deadline and 78% of the national capacity chose to ignore it, and suddenly there is separate legislation, and everyone is clambering to get it... So, for some places, [the Regulator] will need monitoring powers to get [police forces] to be quick with accreditation." **[R17]**.

6.3.1.2 Investigation and sanctioning powers will be "game-changing"

The majority of participants thought that with investigative and sanctioning powers, the Regulator will be recognised and have the authority to oversee quality across the board of FSPs. Some participants recounted some previous cases of high-profile quality failures within some FSPs and bemoaned the lack of statutory powers for the Regulator to suspend the service providers who were involved. Without sanctioning powers to back the current regulatory duty of investigating quality failures, it was thought that the Regulator would not make a "*significant impact*" on public confidence in forensic science. With sanctioning powers, some participants were hopeful that the Regulator would be able to impose sanctions on FSPs for breach of quality standard and quality failures. For instance, in the extract below, an independent practitioner was of the view that the Regulator would be effective to mitigate risks of quality failures only if individual FSPs know that the Regulator can "*wield the big stick*":

> "...unless [the Regulators] are able to wield the big stick; it is not only having the courage, but [they] have to be able to wield the stick, and the stick is only effective if the industry knows that you are capable of wielding and will wield it!" **[R08].**

In the extract below, an independent practitioner explained that statutory powers to sanction police forces for quality failures or for not meeting accreditation deadlines are "*significant powers*" which will put the Regulator in a "*powerful position*":

> "First of all, the Regulators would be able to say to the police forces that they are not going to be allowed to do their work if they haven't got the accreditation. Now that's a really, really significant power to have. Secondly, if they make an error, the Regulators will then have the power to say, 'they are not competent to do this work'. The chances are that they will put action plans and timelines in place… But if they don't achieve in on the date, the Regulators will have the power to say, 'you can no longer do this work'. That's a very powerful position to be in." **[R03]**.

Sharing similar aspirations as the above for sanctioning powers, a participant from a private large-scale FSP described the FSR Bill as "*a game-changer in many senses of the word because it changes and evolves the forensic environment to a different level."* **[R13]**. Some police participants also supported sanctioning powers for the Regulator. For instance, a police participant explained that if the Regulator could suspend police laboratories from providing some forensic science services, it will cause police forces and police authorities to "*sit up*", support and invest appropriately in resources for quality. This was captured as below:

> "Of course, with statutory powers, if it enables the Regulator to come and investigate or particularly suspend a unit, that will certainly make people sit up and think about whether they put enough money into that, whether they resource it appropriately, whether they are supporting that." **[R14]**

Also, some participants were supportive of statutory powers for the Regulator to issue corrective actions to or demand them from FSPs for breach of quality standards and quality failures. The participants believed that this would help the Regulator to disseminate and enforce recommendations for learning lessons and continuous improvement across the wider forensic science landscape. Some participants, including police participants, were hopeful that investigation and sanctioning powers will cause police forces to tighten up and review their forensic science practices to ensure that there are consistency and a fair system across the board of FSPs. Emphasis was placed on police crime scene investigations. In addition to the lack of accreditation for crime scene investigations, it was stated that variations exist in crime scene examination methods and procedures across both individual and police regional collaborations.

6.3.2 Negative changes of the FSR Bill

6.3.2.1 An "iron fist" regulation could cause a decline in forensic service provision

With powers to issue compliance notices, it was emphasised that regulation will force accreditation on all FSPs. However, the majority of participants were concerned about powers for the Regulator to prohibit the practice of FSPs for non-accreditation. For the financial difficulties faced by both private FSPs and police forces, and the cost of accreditation, it was found that prohibition powers threaten the collapse of private FSPs. A participant from small-scale FSP stated that the FSR Bill

will "*put a heck of a weight*" on FSPs which will be detrimental for small-scale and sole-traded FSPs. **[R07]**.

Some participants from small-scale FSPs admitted that prohibition powers could get rid of unqualified practitioners from the forensic marketplace. However, the participants were worried that the FSR Bill has been "*pushed the other way*". Participants were concerned about losing competent practitioners and small-scale FSPs who cannot afford expensive accreditation. It was stated that losing "*any*" forensic science provider from the marketplace for financial difficulties but not because they are incompetent "*is not the right way*". For these concerns, an independent practitioner described the FSR Bill as "*iron fist*". In the extract below, the participant illustrated how both the expensive cost of accreditation and statutory regulatory powers to prohibit the practice of FSPs for non-accreditation put the forensic science marketplace at risk of losing competent sole-traded practitioners:

> "I think they are trying to eradicate people who clearly aren't qualified to be doing what they are doing... But I think it's been pushed the other way. So, for example, there is no reason why I can't do any defence work for a fibre case. But what [the Regulator] is enforcing is that unless I have accreditation, I can't give evidence in court. So, I can no longer take on that defence case because it's just me working in the university, and I can't afford accreditation because it is expensive, very expensive! So, I don't think that's right either." **[R01]**.

Some participants also thought that collapsing small-scale providers and losing the expertise of practitioners will introduce a monopoly in the forensic marketplace, where only "*the big names*" will be available to provide forensic services. It was emphasised that that will also affect forensic science services for the defence which is provided by small-scale and sole-trader practitioners.

Some police participants also indicated that if police forces are prohibited from providing some forensic science services because they could not achieve accreditation on time, that will be the "*downside [of statutory powers] because police forces will not be able to provide the evidence they need to*." **[R11]**. A police participant stated that, already, there is a lack of capacity for some forensic science services in the forensic science marketplace. The participant, therefore, emphasised that further collapse of any FSPs will have negative implications for the investigation of crime. In the extract below, the participant explained that the aspiration for the FSR Bill is right, but the execution is wrong:

> "If the Regulator is able to close down the labs, yes, it will mean that crime investigations would stop. I am not sure why that is good. So, the aspiration is right, but the execution is wrong. So, all the Regulator is basically saying is, to say that this is an accredited lab, you have to focus all your effort in doing that or we close you down... Well, if anybody thinks

> that there is a capacity in the rest of the country to take on the work because you closed down one of the labs, there isn't, there is nowhere else for the work to go if you don't pass [accreditation] or pass it in time… " **[R09]**.

6.3.2.2 FSR Bill could threaten internal motivation for improvement and innovation

It was found that statutory powers to prohibit the practice of FSPs for non-accreditation could risk the good internal motivation that FSPs have towards accreditation. Especially, as police participants admitted that sanctioning powers could increase the number of accreditations for some forensic science areas within policing, it was found that some police forces could be needing accreditation only to avoid legal consequences of statutory regulatory powers. A police participant admitted this in the extract below:

> "If the [Regulator's] deadlines for accreditation are being enforced and, we in some places, couldn't meet them, what will probably happen is if it does make it law, we will get it, isn't it? If you are forced to get something you do it, don't you?" **[R11]**.

However, sharing similar reasons as the above for gaining accreditation, other police participants opined that being forced by regulation to get accreditation will be deleterious to the motivation for good practice in forensic science laboratories. For instance, a police participant shared an observation of the wrong motivation for accreditation within police forces as a result of the statutory accreditation for fingerprint and DNA analyses. The participant explained that the majority of police forces have gained or are gaining accreditation to avoid legal implications, such as to avoid the potential for fingerprint and DNA cases being challenged in court by the defence. The participant countered this motivation and the increase in the numbers of accreditation with the risk of police forces misunderstanding the reason for accreditation. In the extract below, the participant thought that it is "*sad*" that the Regulator needs sanctioning powers to drive accreditation because it will cause police forces to forget about the essence of accreditation, which is to help them deliver quality service:

> "I think [statutory powers] would make a huge difference but I counter that! I think it is sad the Regulator needs regulatory powers because it comes back to why we are doing quality. If you understand why you are doing it and the benefits, you shouldn't need someone with powers to tell you to do it...Police forces are getting accreditation [for fingerprint bureaux] to fulfil separate legislation; they are forgetting why they should want to do quality and deliver it." **[R17]**.

Some participants also thought that statutory enforcement powers would "*only*" impose strict conformance with regulatory requirements on all FSPs. A participant explained that such outcome "*is not a step toward conformity [but] actually a step backwards"* because it restricts forensic science into a set of guidelines and prevents "*people from questioning and having different*

views". **[R16]**. It was also found that compliance notices and prohibition powers could stifle flexibility and innovation in forensic service provision. Coupled with the costs of gaining and maintaining accreditation and undertaking research and development works into developing their methods and procedures, some laboratory participants felt that the FSR Bill will make it difficult for FSPs to innovate new and better methods for forensic testing and analysis. In the extract below, a police participant illustrated that statutory regulatory powers "*will be a blocker to trying to do new things*" because such would come with both cost and sanctions for accreditation:

> "The aspiration [of the FSR Bill] is that everybody will be accredited, that...everybody will be doing things in the same way. To a certain extent, it stops innovation, because if through a research project we found a better way of developing finger-marks on a polished diary, for example, [and] we developed our own methods, we can't use that method because it has not been accredited. So, why would we [research and innovate]; because it is just more expensive, and it is more paperwork? So, why would we evolve and innovate something new? Ultimately [the statutory powers] will be a blocker to trying to do new things." **[R09]**.

6.3.2.3 Statutory powers are insufficient reforms

The majority of participants highlighted gaps in the proposed statutory regulatory powers in the FSR Bill. Firstly, by referring to the limited staffing of the FSR, some participants thought that even with investigation powers, the Regulator cannot inspect a large number of police forces and private FSPs in "*any meaningful way*" to identify areas that detract quality. For instance, an independent practitioner shared experience from forensic consultancy work within policing. The participant explained the long duration it takes to review the forensic science practices of a single police force. The participant, then, questioned the capacity of the Regulator to investigate across the board of FSPs, and thought that "*statutory powers for the Regulator would only make a little difference in the short term*". This was captured below:

> "The [Forensic Science Regulator] do not have the capacity or in fact necessarily the ability to actually look for where these things are [in policing] … Just to look into one police force alone, when I was in the standards unit, takes about a week there and then you stumble across a cupboard which is stacked from floor to ceiling with DNA swabs that haven't been submitted [for laboratory analysis]." **[R18]**.

Secondly, some of the participants thought that the FSR Bill is incompatible with the "*core spectrum*" of the problems faced across the wider forensic service provision. Particularly, some participants explained that the FSR Bill lacks a holistic approach to reforming forensic science regulation. An independent practitioner thought that the FSR Bill is "*too pragmatic and practical*" and fails to address fundamental issues of what classifies as forensic science and what does not. The participant thought that this fundamental question should reform the scope of the FSR and

influence later decisions about regulation. However, the participant was "*disappointed*" that this is lacking in the approach of the FSR Bill. ***[R12]***.

Some participants also highlighted the existing gap in regulatory oversight for non-laboratory forensic science practices within policing. It was then explained that the aspiration of compliance notices and prohibition powers for non-accreditation will further widen the gap in regulation between laboratory and non-laboratory forensic science practices. In the extract below, a small-scale specialist provider—also a previous member of one of the Regulator's specialist groups—thought that the FSR Bill will be a "*great mistake at the moment*" and will yield bad results if the fundamental issues of lack of oversight for some forensic science practices are not addressed:

> "I think [the statutory powers] will be a great mistake at the moment, unless [they] define what the Regulator is going to do…and I think the model at the moment is not looking at the core spectrum of the problem [of forensic science]. If you have bad regulation and it is enforced by law, then you end up with a very bad result, indeed! **[R06]**.

Another independent participant could not perceive the FSR Bill making any significant change to the quality of forensic science. The participant thought that statutory regulatory powers will not have any "*proper effect*" until the purpose of the FSR role is made clearer. In addition, it was explained that the statutory regulatory powers give a false sense of hope for "*changes*" in forensic science unless the lack of adequate responsibilities and funding for the FSR, and financial difficulties within the forensic science sector are addressed. The participant's dislike for statutory regulatory powers was captured below:

> "I don't see anything changing, substantially, for the better, until the system beneath the Regulator is addressed… I'd rather no statutory powers be given at this point than statutory powers that don't have a proper effect. And if we accept a poorly drafted bill, that we accept that the Regulator is given a proper standing within government but actually when it comes down to practicalities nothing really changes, then we are kind of party to the failure." **[R08]**.

6.3.2.4 The Regulator could overstep boundaries with prohibition powers

With powers to prohibit the practice of forensic science providers, some participants thought that the Regulator will be essentially deciding the admissibility of forensic science evidence in court. This was explained as the sole prerogative of the court that they "*will [n]ever want to allow anyone else to decide, including who appears in court and who doesn't*." **[R16]**. While other participants found prohibition powers as clashing with the duty of the court, an independent practitioner stated that the FSR Bill "*would be the worst possible step for the British legal system"* if the Regulator is given prohibition powers. **[R16]**. In the extract below, a police participant thought that there is a

"*fine line*" between the remit of the Regulator setting the requirements for quality standards and prohibiting FSPs for not gaining accreditation with the quality standards. The participant thought that with the proposed statutory regulatory powers, the Regulator will overstep their boundaries as a quality assurance regulator:

> "…I think that the Regulator feels that at some point if she has got statutory powers, she can effectively suspend organisations from completing their work if they are not accredited. But even if they are not accredited, I don't think it is for the Regulator to decide that a piece of evidence is admissible, thus, to the court. So, I suppose in some ways, there is a fine line around setting standards and then actually going beyond that in terms of what is admissible in court." **[R14]**.

Some participants also shared their opinions about lack of clarity in the FSR Bill, in terms of how the Regulator will apply discretion to issue compliance notices and prohibition of FSPs. The participants were concerned that a one-size-fits-all approach of sanctioning FSPs will be incommensurate with the purpose of quality management systems in forensic science. For instance, a police participant stated that the Regulator should be able to sanction FSPs based on the significance of quality failures or for persistent errors. In the extract below, the participant opposed a "*blanket*" approach where any errors would automatically lead to the prohibition of individual's practice:

> "…it is the significance of the impact of that error that, for me, [should] determine whether you are suspended from undertaking your work. It is all the same that you have to accept that there will be errors and that is why you have the systems in place, not only to try and mitigate against errors but to deal with errors when they happen. And that error [should not] automatically mean that that gives the regulator the right to suspend on every single case... So, in a way, [sanctioning] shouldn't be blanket." **[R14]**.

6.4 Research Question four: What are some potential regulatory practices for improving the model of the FSR?

6.4.1 Unannounced inspections will not be feasible

Participants were asked to share their opinions whether unannounced inspections by the Regulators could enhance the detection of quality failures to minimise the impact caused by delays in identifying quality failures. Participants admitted that unannounced inspections targeted at reviewing the casework of FSPs are "*good ethos*". It was found that this could complement UKAS' assessment of the methods and procedures of FSPs. However, it was found that unannounced inspections could be non-economical, as it will add additional costs which either the Regulator or individual FSPs must bear. The majority of participants also thought that it will add "*extra work*" to the Regulator. Additionally, it was found that inspections could compete with the time needed for casework by FSPs, which could be suppressive and counter-productive to the work of FSPs. An independent practitioner explained the implications of unannounced inspection as below:

> "There is a cost involved with that that somebody is going to have to pay, and there is an inconvenience and that it might interfere with productivity. So if you are working in the lab where they are hard-pressed for time—which seems to be all of them these days—a sudden unannounced inspection is going to take a day or perhaps some days which could potentially have quite significant implications for casework, and financial implications as well." **[R05]**.

Some laboratory participants opposed unannounced inspections based on the notion that the internal peer-review and methods for quality checks within individual laboratories are already serving the purpose of scrutinising the casework of FSPs to detect quality failures. Others also stated that unannounced inspections are not necessary because defence forensic science service providers already provide external scrutiny to the work of prosecution service providers. It was also found that the effectiveness of unannounced inspections to detect quality failures is not straightforward. Some participants thought that without knowledge of cases of quality failures to prompt inspections, it will be difficult for the Regulator to find errors or "*cracks which cause errors*". On the contrary, it was thought that inspections will be more effective if it is directed towards investigating reported quality failures.

Also, without cases to prompt inspections, some participants thought that the approach will be similar to UKAS' accreditation assessment, which inspects the methods and procedures of FSPs rather than reviewing the casework of FSPs to identify errors. A laboratory participant stated that "*having a body to come and do more work like UKAS would make no difference*." **[R02]**. From the perspective of forensic evidence in court, an independent practitioner argued that it will be difficult

for the Regulator to identify errors because of the lack of a "*joined-up process*" of forensic service provision between FSPs and the courts. This was explained as below:

> "[Unannounced inspection] is a good principle; it is a good ethos. But the question is during that process, what are you hoping to uncover...if the scientists have always followed the procedure? Something must have to go wrong, either from prosecution or a defence perspective to alert you to be more in-depth to look at things...And because we don't have a complete joined-up process of understanding how well things take place in court, we can't complete the circle to say that forensic science helped us to get a prosecution, or that, forensic science hindered prosecution." **[R03]**.

6.4.2 There should be a quality culture among forensic science practitioners

The majority of participants admitted that regulation is limited in minimising and mitigating risks of quality failures in forensic science laboratories. It was emphasised that it is difficult for regulation and accreditation to prevent quality failures, especially, caused by unethical practitioners. However, it was explained that building a "*quality culture*" across the wider forensic science community and within individual forensic science practitioners could enhance good forensic science practice, including reporting of quality failures by individuals to the Regulators.

Some independent practitioners stated that both "*mechanistic*" approach of regulating forensic science, like the FSR role, and cultural approach of 'regulating' forensic science are equally important. For the cultural approach, the participants highlighted that much attention should be focused on the Chartered Society of Forensic Sciences (CSFS). In the extract below a participant explained that it will be "*very rare*" for regulation to be effective if there is a lack of "*quality culture*" among forensic science practitioners. The participant emphasised that the CSFS promotes quality culture, interest, commitment and passion among the community of FSPs. However, the participant was worried that the FSR role has taken over the needed attention for the CSFS:

> "It is all very rare having regulation if you don't have a quality culture. So, organisations in the forensic science community need to attend to their own culture. And I think one of the values of the Chartered Society of Forensic Sciences is to promote that culture, interest, commitment and even passion among the community of forensic science itself. And, I'm slowly worried that that aspect of forensic science and the work of the Chartered Society is being neglected… and that sort of mechanistic commitment to a regulatory procedure is being pursued, which is hard to argue against, but I think the cultural model is at least as important as the regulatory one." **[R05]**.

Also, all police force participants emphasised that individual police forces should invest in quality management systems and prioritise good leadership and governance in police in-house forensic science laboratories. Police participants warned against overreliance on accreditation assessments as the only assurance for quality. Also, participants advocated for individual practitioners to take

ownership of quality management in police forensic science laboratories. For instance, a police participant explained that "*the big thing about quality and accreditation is culture...to get staff buy into and understand why [accreditation is in place] so that [staff] are confident to report errors...early enough to mitigate the risks and to stop an endemic problem continuing*." **[R14]**.

A police participant emphasised that "*any regulation will never sort of catch all the bad eggs, really, [especially], if someone is hard-bent on breaking guidance."* **[R11]**. In the extract below, another police participant explained that laboratories should implement the appropriate quality management and internal quality checks, in addition to providing good governance to ensure that staff are following procedures for quality. Without these, the participants stated that regulation and accreditation visits by UKAS alone will not make any difference in minimising the risks of quality failures.

> "… [Regulation cannot] make any difference whatsoever because there is no way of ensuring that when [UKAS] aren't there looking at people, that they [are] actually carrying out those [quality checks and procedures]. It still comes down to people, it still comes down to whether you have got good governance in place [in the laboratory], whether your management structure is appropriate, whether you do your internal quality checks. And if you want somebody to assess those things then they need to be there all the time. You can't come there once every four years to say 'yes, they look fine'!" **[R09]**.

6.5 Chapter summary

This Chapter has captured the experiences, views and opinions of independent forensic practitioners and participants from across different forensic science organisations. It has provided evidence of the factors affecting the FSR role and the operation of the Regulator; the positive and negative impacts of the Regulator's programme of work on the activities of FSPs; some positive and negative changes perceived as potentially arising from the FSR Bill and, some recommendations for improving the FSR role. This Chapter, therefore, provides further insights which address the gap in knowledge identified about the FSR role and its impact on the quality of forensic service provision. The evidence in this Chapter also complements the findings of the document analysis in Chapter 3.

Chapter 7. Discussion

This study explored the fitness of the FSR role in improving the quality of forensic service provision from the crime scene to court. It was argued that achieving the purpose of regulation will be dependent on the extent to which the appointed FSR is able to develop and execute programmes fulfil the role of the FSR, and the extent to which these programmes can support and enhance FSPs to meet the features of forensic service provision demanded of them by the CJS. The fit for purpose of the FSR role was, therefore, examined by assessing: 1) the structural and contextual factors that impact on the FSR role and affect the operations of the regulator; 2) the extent to which regulatory requirements and interventions impact the quality of the work of FSPs; 3) changes that the FSR Bill could bring to the regulation and provision of forensic science, and 4) to make recommendations for an improved forensic science regulation. The subjective and intentional experiences and views of FSPs who are well-acquainted with the FSR role were sought through semi-structured interviews. This chapter interprets the findings of the interview data and utilises them to answer the research questions and position this study within available literature.

7.1 What structural and contextual factors impact upon the FSR role?

For the Regulator to be successful at fulfilling the role of the FSR, the study determined that the three factors which the literature indicates are likely to influence the effectiveness of regulation should co-exist. These comprise an appropriate institutional framework for regulation, compliance with the regulation by FSPs, and an overall system of forensic science service provision that supports the purpose and the work of the Regulator. The first research objective was, therefore, to determine which of these factors, either individually or in combination, impact upon the FSR role and affect the successful operations of the Regulator. Based on the data, some conclusions can be drawn with varying degrees of confidence regarding the structural and contextual factors that impact upon the FSR role and affect the operations of the Regulator.

7.1.1 Regulatory structure and implications on the Regulator's performance

The interview data indicated that the achievements of the successive Regulators in establishing a single framework of quality standards; enhancing accreditation with validation requirements; investigating (some) cases of quality failures, and disseminating lessons for learning, cannot be dismissed. However, the data suggested that the satisfactory performance of regulatory duties cannot be claimed without also acknowledging the challenges faced by the appointed Regulator. These challenges were apparent through the description of the FSR role as a "difficult position", due to both limitations of both the regulatory framework and the financial and workforce capacity

to support the work of the Regulator; these make it difficult for the Regulator to perform their duties to their fullest extent possible. The experiences and views expressed by participants about the FSR role corroborated with the evidence that was captured in the document analysis. This is an indication of the experience and intimacy of the participants with the FSR role, which also enhances the credibility of the fieldwork data.

The document analysis captured the extent to which the Regulator continues to establish and expand the quality standard framework to cover different forensic science disciplines and activities. During the interviews, the majority of participants considered the lack of statutory enforcement powers for the Regulator as one of the key limitations of the FSR role. This limitation was fundamentally associated with the slow pace of police forces to meet accreditation deadlines set by the Regulator. Yet, aside this demonstrable relationship, the lack of statutory regulatory powers does not supersede the other factors which equally contribute to the problems of accreditation. The data emphasised that successful accreditation of individual FSPs, whether police forces or private FSPs, is dependent on a mixture of factors. It was apparent that the internal motivation for accreditation and the availability of adequate financial and technical resources by FSPs are the critical factors for gaining and maintaining accreditation. This makes it difficult to single out lack of statutory regulatory enforcement powers as the 'only', or even the most significant cause of police forces' slow progress towards accreditation.

As all police forces interviewed for this study have maintained accreditation for the majority of their forensic science activities, even under non-statutory regulatory requirement, and continue to extend accreditation to other areas, the "pain" and "struggles" of getting accredited affirm the significance of inadequate funding and resources. Therefore, inadequate funding for police forces and private FSPs, if not more, is equally consequential on accreditation as the lack of statutory enforcement powers. The impact of financial problems on getting accreditation at a desirable pace suggests that under voluntary accreditation requirement, providing adequate funding and technical resources for police forces could boost accreditation for areas where gaps exist. This is underpinned on their commitment and internal motivation towards accreditation. However, providing regulatory enforcement powers may not necessarily increase the accreditation of police forces (or even private FSPs) if there are still problems with funding and technical resources. This finding advances the almost one-sided picture of 'non-compliance' with accreditation which was found in the stakeholders' reports. Non-compliance is often reported as a deliberate resistance to accreditation by police forces because of the lack of statutory regulatory enforcement powers. However, this study has found that such views sidestep the good motivation of police forces towards accreditation and the significance of inadequate funding and resources for police forces to afford accreditation

assessment, to develop, validate and maintain systems and methods, and to undertake research to improve upon systems and methods.

In terms of the investigation of quality failures, there were concerns that due to the lack of regulatory sanctioning powers, the Regulator is unable to sanction FSPs for quality failures and to compel them to abide by post-investigation recommendations. Risks of future non-compliance with post-investigation recommendations are, thus, perceived among some FSPs. Yet, the successes of the Regulators with investigations of quality failures could not be disconnected from the goodwill and commitment of FSPs who identify and report cases to the Regulator and cooperate with investigations. In addition, the evidence suggested that FSPs adhere to the Regulator's post-investigation recommendations to learn lessons for improvement. However, the evidence to support the claims of a relationship between lack of sanctioning powers and non-compliance with recommendations was poorly established. This means that the data does not provide supportive evidence in terms of why FSPs may refuse adherence to regulatory recommendations. However, it can be inferred from the challenges of accreditation that if recommendations require FSPs to make some financial commitment, then compliance may be challenging.

Also, the pressures on the FSR role due to inadequate funding and workforce capacity for the Regulator to conduct investigations and oversee quality on the ground across individual FSPs were obvious to all the participants. As was found in the document analysis, the implications of these pressures have been that investigation will always drain the resources of the Regulators, causing delays and obstructing the ability of the Regulator to tackle other areas of forensic science where risks of quality are perceived or identified. This includes the inability of the Regulator to adopt innovative measures for risk mitigation, such as extending investigations into other disciplines of forensic science where high risks to quality may be in need of urgent attention.

A further criticism of the regulatory framework relayed by participants indicated that the FSR role is "ambiguous" and has "limited oversight" for forensic science more generally. This limitation was linked to the "bigger problems" of forensic science that were observed by participants, which altogether raised questions about the fitness of the FSR role in overseeing and improving the quality of the end-to-end process of forensic science, from the crime scene to court. Even though documentation explaining the FSR role suggests that the scope of regulation is forensic science from the crime scene through to court,[365] most participants thought that there is a shortfall in oversight for non-laboratory forensic science. The FSR Codes now incorporate requirements for crime scene investigation, including but not limited to, the assessment, search, identification,

[365] Rennison, 'The Forensic Science Regulator Business Plan 2008/09 - 2010/11' (n 7).

recovery and recording of evidence, using ISO 17020 standards. However, it is clear that FSPs will not be able to gain accreditation for these crime scene investigation standards by the deadline of October 2020.[366]

In what seems a long-overdue problem, participants thought that the shortfall in the scope of regulation is due to failures by the successive Regulators to properly define forensic science. This may be due to the broad nature of the many disciplines which can be designated as 'forensic science', including novel and emerging disciplines, and the lack of motivation for the Regulators and the community of FSPs to settle upon a definition of forensic science for the purpose of regulation. This is also compounded by the lack of accreditation of police crime scene investigations; and the 'non-scientific' practices concerning police submission and commissioning of forensic analysis and development of investigative strategies. It is for this reason that non-laboratory forensic science practices were considered more of a threat in their potential for causing miscarriages of justice than laboratory-based processes, where the FSR role seems to focus. It is also for these reasons that non-compliance with accreditation was deemed a 'lesser problem'. Experts may have, perhaps, envisaged this challenge when they recommended that the FSR should define and cover forensic science as broadly as possible, certainly including experts working for the defence, police laboratories, scenes of crime methodology and operations and pathologists.[367] However, participants criticised the current diminutive remit of the FSR and highlighted some implications which have also been perceived by Laurin,[368] that the quality of forensic science is threatened if regulation of forensic science is narrowly perceived as concerning only laboratory practices and quality standards and accreditation but not the upstream dynamics and usage of forensic science by police forces, including forensic procurement.

The criticisms of the FSR model, therefore, indicate that while the purpose of regulation is appealing to FSPs, the institutional framework does not align the operations of the Regulator to this purpose. The evidence shows that while the FSR role faces an increasing and changing demands about the quality of forensic service provision, the resources for Regulator to successfully function are being reduced. The recent annual report of the Regulator shows that budget for regulation has been reduced, again, following an increase only in the previous year. The Regulator has described this as disappointing.[369] As has already been pointed out, starving the FSR with the appropriate manpower, funding, and the institutional superstructure it needs raises questions about the ability

[366] Accreditation has been deferred due to COVID 19. See pages 6 to 15 of the FSR Codes (Issue 5).
[367] Rawley and Caddy (n 127).
[368] Laurin (n 311).
[369] Tully, *Forensic Science Regulator Annual Report 2019* (n 145), p.56.

of the Regulator to expand oversight for and improve the quality of forensic service provision, not least beyond the laboratory settings.[370]

7.1.2 Compliance with regulation by FSPs

An important determinant for achieving regulatory goals is the nature of the response to regulation by regulated organisations.[371] Regulation is accepted, or likely to encounter less resistance when both regulators and regulated organisations have mutual purposes. Secondly, regulated organisations are motivated to comply with regulation if they perceive regulatory interventions and initiatives as appropriate to achieving those purposes. In this study, the experiences and perceptions of individual FSPs captured the extent to which they support the FSR role; the extent to which they thought regulatory requirements and interventions align with the purpose of quality and improvement; and the extent to which they are motivated to comply with regulation.

Almost all participants expressed their admiration, acceptance and support for the FSR role which was described as an "agent of good practice". A single Code of Practice and Conduct and requirements for accreditation and validation of forensic science methods and processes were perceived as being in the interest of consistent and robust forensic science practices. Also, the investigative function of the Regulator was admired and supported due to the lessons-learning opportunities provided. It has, therefore, in the collective interest of FSPs to comply with regulatory requirements for accreditation and reporting of quality failures and to adhere to the Regulator's post-investigation guidance.

The FSR clarifies that all FSPs offering forensic science services to the CJS are bound by the FSR Codes, and the method of demonstrating compliance with the Codes for most forensic science disciplines is through relevant accreditation to the ISO 17025 and ISO 17020 standards. It was found that, except for some specialist small-scale FSPs, most of the laboratories represented in this study have got accreditation that covers most of the forensic science services they provide. The majority of them had achieved relevant accreditation to the ISO 17025 before the creation of the FSR role. Consequently, maintaining accreditation and/or extending accreditation to include requirements in the FSR Codes has been predominantly driven by the internal motivation and belief that accreditation is "essential" for minimising and mitigating the risks of quality failures.

However, for some police forces and small-scale FSPs, who have gaps in accreditation for some forensic science disciplines, they continue to work towards achieving accreditation by deadlines set by the Regulator, some of which have passed, and others have been extended in the fifth issue

[370] Jonakait (n 305).
[371] Brownsword and Goodwin (n 10), pp.318 - 340

of the FSR Codes. These include accreditation for collision investigation and fire investigation.[372] As some police forces felt they are being 'forced' to get accreditation by deadlines, it is difficult to pinpoint whether accreditation in this instance is necessarily sought because of internal motivation and the perceived benefit of accreditation or whether to fulfil regulatory requirements. This distinction is important, due to the finding of a study which showed that service providers who are internally motivated to pursue ISO accreditation experience higher improvement in their service provision process than those who get accreditation to please external regulation.[373]

For the private small-scale FSPs and police forces whose progression towards getting relevant (full) accreditation have been slow, this raises questions whether internal motivation and non-binding deadlines are a sufficiently forceful push to help them achieve accreditation at the pace desired by the Regulator. While this question holds, there was no evidence to suggest that delays or gaps in accreditation are caused by a complete disregard or a deliberate resistance to accreditation and regulation by police forces and small-scale FSPs. As the majority of them stated that they are working towards getting accreditation and validation for areas where gaps exist, delays were attributed to technical and financial challenges faced by almost all FSPs. Small-scale FSPs and police forces are, however, disproportionately affected by these difficulties due to weaknesses in financial standing and technical soundness for entering the accreditation process. This finding reiterates that of a previous study which surveyed the experiences of FSPs about accreditation.[374] As a result, the impact of both internal motivation and inadequate financial and technical resources on the pace of accreditation of FSPs cannot be underestimated.

More generally with regulation, it is argued that where compliance involves financial cost, regulated organisations would comply with regulatory requirements if they believe that compliance makes economic sense.[375] It should be stressed that for all the quality standard requirements by the FSR, only compliance with accreditation requires a financial commitment by FSPs. Hence, the significance of financial problems on attaining (timely) accreditation, whether voluntarily or enforced by legislation, cannot be underrated, as all the FSPs equally complained about the cost of accreditation and lack of adequate funding. For the financial difficulties faced by all FSPs and particularly across police forces, the apparent calculated compliance towards accreditation by some police forces and small-scale FSPs may not be surprising.

A clear need for accreditation was demonstrated in the response of police forces and small-scale FSPs. However, the data was compelling that police forces and small-scale FSPs are frustrated

[372] The Forensic Science Regulator (n 143).
[373] Singels, Ruël and Water (n 300).
[374] The Chartered Society of Forensic Sciences (n 202).
[375] Brownsword and Goodwin (n 10), pp.318 – 341.

towards accreditation, primarily, because of the lack of adequate funding and technical resources to afford the cost of accreditation and/ or to easily manoeuvre through the technical challenges of accreditation and systems and methods validation. Limited resources for accreditation across police laboratories, in general, was associated with the institutional problem of lack of proper financial commitment and investment in resources by some police force authorities, who make the decisions concerning budgeting for operational policing and forensic science, including accreditation. As a result, the problems with the accreditation of police laboratories cannot be dissociated from the root cause problem of cuts to police funding for forensic science. The depth and persistence of cuts to police funding were obvious to both police forces and private FSPs, as they all felt its implications through the seemingly logical approach of cost-saving and price-driven forensic service provision. The problem of cuts to police funding for forensic science has informed recent funding for the Transforming Forensic Programme and Forensic Capability Network within policing, and this may give hope for imminent potential changes in the accreditation of police forensic science laboratories.[376]

Unlike accreditation, the data showed that the internal motivation of individual FSPs was enough to secure compliance with other regulatory requirements and guidance, such as satisfactory compliance with the Regulator's risk-mitigating measures. This was evident in individual FSPs' commitment to report cases of high-risk quality failures and/or that of other FSPs for transparent forensic practice and to inspire learning. From the data, it was unquestionable that this commitment was crucially linked to the negative impact of quality failures on the CJS and the 'bad name' it gives individuals and the community of FSPs.

Notwithstanding, there was also a relationship between the commitment of FSPs to adhere to the Regulator's investigation of quality failures and post-investigative recommendations and the appropriateness of the Regulator's approach of investigation and information dissemination. FSPs exhibited trust and confidence in the Regulator's ability to disseminate information for learning lessons to prevent recurrence of systemic errors across the wider landscape of FSPs. These findings may explain the increasing number of quality failures being reported annually to the Regulator by FSPs, as was found in the document analysis. In addition, the qualitative finding provides evidence about the sensitive nature of this component of regulation. The participants indicated that unless cases of quality failures are reported by individual FSPs, the Regulator is limited in identifying cases of, or issues which pose the threat of quality failures. This suggests that a successful risk

[376] 'Forensics secures £28.6m in government funding'; https://www.fcn.police.uk/news/2020-02/forensics-secures-28m-government-funding-boost

mitigation approach is dependent on the mutual support and purpose for learning lessons and transparency that exist between the FSR and FSPs.

However, contrasting the intentions and commitment of FSPs to report cases of quality failures, there were claims of the potential trade-off between learning lessons and suffering at the hands of an entrenched "blame culture" and the bad publicity of quality failures. While these are perceived triggers for potential non-compliance, they were found to engender bad perceptions about quality failures which could frustrate the risk mitigation measures of the Regulator. On the contrary, they suggest that if quality failures are handled in a manner that limits blaming individuals involved in cases of quality failures, this can improve the efforts to mitigate the risks of quality failures. This confers hope to the Regulator's initiative for lesson learning which is incorporated in the investigation and dissemination of information about quality failures. This should help align the FSR's risk mitigation measures with the objectives of transparency and overall learning to improve the quality of forensic service provision.

7.1.3 The system of forensic service provision and implications for the FSR role

Recently, attention has focused on how the forensic science marketplace can be sustained. A recent report has found that the management of the forensic science marketplace poses a serious risk to the CJS.[377] However, discussions on the sustainability of the marketplace often tend to miss out on how the system of forensic service provision affects the FSR role. Although the Regulator has no remit over the forensic marketplace, the collaboration between the two is anticipated to achieve regulatory objectives, where appropriate. The data showed an instance of collaboration where police forces' voluntary forensic procurement arrangements with private FSPs, and competition between private FSPs in the marketplace, to some extent, motivate accreditation of private FSPs. This emphasises the potential for the forensic marketplace alone to drive the accreditation of FSPs.[378] However, the limitation of this strategy is that it is only effective at enforcing accreditation across private FSPs but not for police laboratories. This also raises questions whether the lack of some (or similar) conditions to compel or incentivise accreditation of police forces may be a contributory factor to the gaps in the accreditation experienced across police forces in general.

As explained previously, police forces and small-scale FSPs lag behind accreditation deadlines primarily because of deep-rooted problems of financial constraints. The depth of this problem has meant that not are police forces and private small-scale FSPs unable to afford accreditation, but

[377] House of Lords Science and Technology Select Committee (n 6).
[378] Forensic Science Regulator, 'A Review of Options for the Accreditation of Forensic Practitioners' (n 124), p.41.

also FSPs across the board are unable to undertake research and development that may strengthen their forensic science systems and methods. This finding is a proof that problems outside the control of both the Regulator and FSPs actively oppose accreditation and, even more challenging, weakens the relevance of the work of the Regulator to address the critical problems which adversely affect the quality of forensic science.

Part of this problem was concerned about the limited input, support and feedback that the Regulator may (still) be receiving from the courts about quality failures of forensic science. Interestingly, even though the lack of investigative or sanctioning powers for the FSR was considered a limitation, there was no evidence where this has been grounds for FSPs to refuse or resist investigations where this has been demanded by the FSR. Rather, there is an indication that in the unlikely event that any FSP may attempt to resist investigations the Regulator can continue to harness the support of the police to conduct investigations, as they have done with previous high-profile cases, including Randox Testing Services and LGC Forensics. These two high-profile cases highlight the importance of feedback and a joined-up process in detecting and addressing issues of quality failures to prompt subsequent investigations.

Overall, in answering the first research question, the experiences and perspectives of FSPs have provided an external view to the findings of the document analysis and have clarified some claims concerning the weight of some factors which impact upon the successful operation of the Regulator. From the evidence gathered, it would be bizarre to reject claims of the limitation of the FSR due to the lack of statutory powers for the Regulator. However, financial problems across the forensic sector and for regulation, and the Regulator's limited oversight for forensic science appear to be more problematic given their cumulative adverse effect on almost all the components of the FSR role. Therefore, when considering the scope of the challenges faced by the Regulator, the lack of statutory powers for the Regulator to compel accreditation can only be considered part of the problems and not the most significant one.

7.2 The extent of regulatory impact on the quality of the work of FSPs

In the context of organisations who perform testing and calibration activities, seeking accreditation to the ISO 17025 standards is expected to help improve organisational structure and the service production or delivery process, which, in turn, should help organisations achieve some customer-based advantages.[379] As a result, the effectiveness of accreditation is based on how it impacts the performance or some features of the service delivery process or service outcomes of organisations.

[379] Karthiyayini and Rajendran (n 298).

For FSPs, accreditation should add value to their work by helping them to continually improve capability and achieve operational and criminal justice objectives.[380] All FSPs in England and Wales are required to voluntarily adopt, achieve and maintain accreditation to the FSR Codes and comply with regulatory requirements and guidance, including reporting complaints and quality failures to the Regulator. This study argued, therefore, that the FSR's programme of work should help all complying FSPs to achieve or meet some objectives required of them by the CJS. Such evidence should indicate whether the FSR role is having some valuable contribution to the work of FSPs and whether the FSR is fit to achieve the purpose for which it was created. The second objective of this study was to explore the extent to which there have been any changes and/or improvement in the quality of the work of FSPs, as a result of the regulator's quality standards, enforcement of accreditation and investigation of quality failures. This comprises how the goals of each of the specific programmes of the FSR are being achieved and how these relate to the CJS requirements for the delivery of forensic services by all FSPs.

7.2.1 Appropriate scientific techniques

It was found that through the Code of Practice, the FSR role has brought commonality in the quality standard requirements that FSPs use as a guide to develop methods and procedures for service provision and accreditation. In terms of a positive impact of accreditation to the Codes, it was found that individual FSPs have seen increasing coordinated activities in their laboratories as staff work together as a team and follow documented procedures. Also, FSPs across the board exhibited an increasing motivation, control over activities, commitment and involvement of practitioners to do what is required of them in the laboratory. Willis[381] has observed similar positive changes within one forensic science laboratory after being accredited for some time. Unsurprisingly, participants whose laboratories were accredited before the creation of the FSR role did not attribute coordination of activities to regulation. However, at least, the FSR role can be credited for widening the accreditation requirement and spreading some benefits across some police forces whose accreditation have been influenced by regulation.

There were some expectations by participants that the Regulator will meet the needs of FSPs by contributing to assist the development of methods and procedures for carrying out specific forensic science testing, analyses and tasks. However, there was evidence that regulation and accreditation are limited at meeting this expectation. This may not be unique to the FSR role as similar limitation has been observed for all standard-developing organisations.[382] Due to this limitation, concerns

[380] Wilson and others (n 309).
[381] Willis (n 289).
[382] Robertson, Kent and Wilson-Wilde (n 46).

criticised the individualised approach by which FSPs adopt the FSR Codes by developing methods and procedures they deem 'appropriate', both in terms of conformance to the relevant standard requirements and fitness for a specific forensic purpose. It was indicated that this precludes a uniform approach of conducting some forensic analyses across the forensic landscape because different FSPs—who provide the same services—can have different methods and procedures for undertaking the same forensic analysis, task or activity, as neither the Regulator nor UKAS instructs FSPs as to which scientific technique, method or procedure is 'appropriate' for a specific forensic purpose.

Except for dip sampling as a peer-review process, consistency in forensic practice as a result of accreditation can only be explained in the context of an individual FSP and not necessarily across the board of FSPs. Thus, the data do not provide sufficient evidence of whether accreditation is improving uniformity of methods and procedures across FSPs who provide the same forensic service. This finding is understandable due to the diversity in the study participants, in terms of the different services they provide. Yet, there were compelling counterarguments that accreditation and the FSR role are weak in assuring that the best practice or appropriate scientific techniques are used across the diverse forensic science sector, whether for general or certain discipline-specific forensic activities. Rather, the onus of appropriate scientific technique lies on individual FSPs who determine the robustness and fit-for-purpose of their forensic science methods and procedures through the validation process. However, there was evidence pointing to the difficulties and limitation of this process.

As explained before, validation is intended to provide the objective evidence that a method, process or device used by FSPs is fit for the specific forensic purpose, by providing the necessary background information about the methods and processes. This includes the ability of a particular method or process to obtain reliable results, the conditions under which such results can be obtained, and the limitations of methods and processes. These were outlined in the 'Omagh bombing' case, where the court held that "the absence of an agreed protocol for the validation of scientific techniques prior to their being admitted in court is entirely unsatisfactory".[383] In this study, deficient validation was found in digital forensic work, as laboratory participants testified about the difficulty with validating digital forensic methods. Also, even though participants acknowledged the general benefits of methods validation, the process was proclaimed to be amenable to individual variation, again, due to the individualised approach where FSPs validate their methods against some determined end-user requirement. The implications of this were

[383] *Hoey, R v [2007] NICC 49* (NICC (2007)).

associated with the difficulty of the court to fully understand the validity of forensic methods. This becomes even more problematic when scientists themselves disagree about the validity of certain methods.

For instance, two small-scale FSPs who provide DNA services conflicted about the use of likelihood ratios as the 'appropriate' or best statistical approach to interpret DNA evidence. This conflict is worrying, given that extensive guideline for interpreting DNA evidence—including Low template DNA—has been published by the FSR.[384] This guideline, which talks about likelihood ratios, have been developed in response to an extensive review of the different methods that major FSPs use to provide Low Template DNA analyses. The Caddy report[385] in 2008 found that across three major FSPs of DNA services, the validation of each provider's DNA profiling method agreed with the ISO 17025 standards. However, each FSP conducted DNA profiling in a slightly different way. For instance, when a DNA extract from a crime scene was analysed by the FSS laboratory, this failed to produce a DNA profile of a suspect. However, the same extract produced a DNA profile when analysed by a private FSP. The reason for these different results was that while the private FSP's methods of profiling included a process that minimises the effect of inhibitors which prevent detection of a DNA profile, this process was absent in the FSS' method. This is a clear indication where different methods, although correctly validated, can achieve different outcomes or demonstrate different appropriateness or fitness for a specific forensic purpose.

Criticisms about different FSPs using different methods and procedures for the same forensic science technique, even if they are validated, is, therefore, not insignificant. It is even more problematic considering that accreditation may appear to cover up the differences in the 'fitness' and limitations of methods and procedures used by individual FSPs. The apparent diversity in method development and validation also suggests that regulation still fails to ensure that the best techniques for certain forensic practices are used by FSPs to provide forensic service to the CJS. In this context, it may be questioned whether accreditation is the best route for ensuring the use of best or appropriate techniques across a diverse forensic sector where FSPs differ in the scope of service provision and activities.

A survey conducted by the CSFS found the lack of common methods and procedures for accreditation problematic for accreditors and the expensive cost of accreditation.[386] For the latter,

[384] Peter Gill, June Guiness and Simon Iveson, 'The Interpretation of DNA Evidence (Including Low-Template DNA)' (2012).
[385] Brian Caddy, 'A Review of the Science of Low Template DNA Analysis' (2008) <https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/117556/Review_of_Low_Template_DNA_1.pdf> accessed 27 May 2020.
[386] The Chartered Society of Forensic Sciences (n 202).

it is unclear how the fit-for-purpose of a method and economic factors tend to influence police force laboratories and private FSPs when adopting, developing and validating methods and procedures to conform to regulatory requirement. This is because different methods and procedures may have different cost implications and bureaucracies for accreditation and validation. The availability of common templates or model documents that can be used by all FSPs, such as SOPs, generic quality management models, and best practice manuals should help reduce part of the cost of accreditation caused by individual FSPs adopting or developing their own methods and procedures.[387] It is also worth adding that common templates and best practice manuals for carrying out both generic and discipline-specific tasks and procedures should address variations and ensure that best practice methods and procedures are used across the landscape of FSPs. The FSR 'technical guidance' appears to address part of this problem, by providing tailored guidance documents for carrying out DNA analyses, forensic anthropology, and other specific forensic science activities and niche forensic science disciplines.[388] However, the lack of adequate funding for the FSR may question the ability of the Regulator to continue to research, innovate and develop new or improved guidance documents for specific forensic science disciplines or for carrying out specific activities.

7.2.2 Efficiency, integrity, impartiality and accuracy

As the participating laboratories in this study differed from each other in some respect, including the services they provide, finding both evidence of regulatory impact specific to an individual or a group FSP based on the service they provide and that which is common or general across all FSPs were important. These include evidence of efficiency, integrity, impartiality and accuracy of forensic service provision. It emerged that determining the impact of the FSR role on the efficiency of forensic service provision is not only beyond the scope of this study, but it is also outside the remit of the FSR and is not even defined in the FSR Codes. However, evidence was found which allows conclusions to be drawn about the impact of regulation on the accuracy, impartiality and integrity of FSPs.

A recurrent theme of a positive impact of regulation was the "increase in confidence" that FSPs across the board have felt about their internal service delivery performance. Notably, confidence was not necessarily attributed to individual FSPs being assessed and accredited by UKAS, as most of the participants acknowledged the limitation of UKAS' accreditation assessment in isolation. Rather, confidence was attributed to some enhancements that the Regulator's requirement has brought concerning some methods and procedures for carrying out specific and general forensic

[387] The Chartered Society of Forensic Sciences (n 202).
[388] https://www.gov.uk/government/collections/forensic-science-regulator-technical-guidance

tasks, such as peer-reviews. This finding is similar to that of Willis[389] who explains that rather than being prompted by accreditation assessment, ongoing improvement in the laboratory is prompted by management review, client feedback, internal audits, and corrective and preventative actions of non-conforming work by analysing, identifying root causes, and corrective actions.

One common positive impact that was attributed to the FSR role was the enhanced checking and reviewing of forensic analysis and results, due to dip sampling—which is a peer-review process. Accordingly, FSPs explained that they have seen increasing transparency, accuracy and credibility of forensic analysis and test results. This impact was particularly significant in police fingerprint bureaux, where dip sampling has been helping to tighten up the review process for fingerprint comparisons that yield 'non-matching' results, to ensure that "nothing has been missed". Also, a more streamlined and consistent process of fingerprint comparison across accredited fingerprint bureaux were attributed to the FSR fingerprint comparison guidance (FSR-C-128).[390] Also, increased awareness for annual competency training for fingerprint examiners and blind peer-reviews are helping to address cognitive bias across fingerprint bureaux. A participant from a large-scale FSP also explained using dip sampling to "often pick up little mistakes" during a review of case files. This suggests that enhanced scrutiny of forensic science analysis may be seen across other forensic science disciplines.

While the evidence of improvement in fingerprint bureaux indicates an instance where enhanced scrutiny and review of forensic results have been revived by regulatory requirements and guidance, this does not authoritatively allow a conclusion that the FSR role may have reduced cognitive bias across all fingerprint bureaux. However, increased awareness by the FSR for bias and errors and efforts to address them indicate a reduction in risks of errors where these may have occurred because of the lack of enhanced review of results. This improvement can be attributed to the FSR role because of how it was experienced/explained between participants whose fingerprint bureaux are accredited to the FSR Codes and those with no accreditation or yet to be accredited. The participants within accredited fingerprint bureaux experienced some tangible outcomes of a costly accreditation process, while those yet to be accredited did not experience this change but were frustrated by the cost of gaining accreditation.

Evidence is also available that dip sampling procedures are making an impact on some fingerprint bureaux in England and Wales. It is reported that some fingerprint bureaux, through dip sampling have detected errors of wrongful non-identification during initial fingerprint comparison, and have

[389] Willis (n 289).

[390] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/638254/128_FSR_fingerprint_appendix__Issue2.pdf

caused initial results and conclusions to be amended from suspect 'exclusion' to suspect 'identification'.[391] The significance of this regulatory impact can be explained in the context of the observation by Warren *et al*.[392] who experienced that among competency testing; proficiency testing; peer-review; and audits, internal peer-review made the biggest positive impact on their laboratory, as it offered a second set of eyes for analytical testing and reporting of analytical results. Yet, there are questions whether dip sampling procedures are being performed with sufficient frequency and promptly enough, to allow for the appropriate scrutiny and consideration of test and analytical results and conclusions before they are forwarded to investigators and juries. This applies also to the individual procedures across different FSPs which are meant to be checking and reviewing test and analytical results and conclusions.

The data gathered does not offer sufficient evidence to conclude the timeliness and frequency of dip sampling or peer-review of analytical and test results and conclusions across individual FSPs. Also, it does not provide evidence about the number of cases where errors and conclusions may have been amended as a result of these procedures, whether before or after results have been provided to service users. A further study of this will be required. Nonetheless, as multiple FSPs testified about the benefits of dip sampling, the FSR role can be credited for increasing procedural and behaviour changes concerning the scrutiny and accuracy of forensic evidence analysis and results.

Also, the data provide information that directly infers a regulatory impact on the integrity and impartiality of FSPs. Integrity is defined as "the quality of being honest and having strong moral principles".[393] While all the laboratory participants explained that they have got procedures in place for handling quality failures, some participants emphasised doing this in recent times in response to the regulator's requirement for all FSPs to report non-conforming works and high-risk quality failures to the Regulator. The literature commends the genuine conviction that service providers have for quality and learning lessons and considers it an indispensable first step for quality assurance and improvement in quality.[394] This was observed across almost all the participants through the expressions of good intentions and internal decisions to report cases to learn lessons from the Regulators' recommendations.

[391] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/848492/L-B06_Fingerprint_results_checking_v1_final.pdf
[392] Warren, Deest and Ballard (n 284).
[393] The Forensic Science Regulator, *Codes of Practice and Conduct* (2020), p.75.
[394] Avedis Donabedian, 'The Effectiveness of Quality Assurance' (1996) 8 International Journal for Quality in Health Care 401.

The Regulator's Codes provide examples of issues which can threaten the impartiality of a practitioner. These include instances where a practitioner is the sole reviewer of the critical forensic findings or where there are organisational and management structures that could be perceived to reward, encourage or support bias. Thus, the benefits of dip-sampling and validation of methods can be argued within the context of impartiality. Validation, in particular, should tackle bias in forensic analyses by ensuring that the methods and procedures are not discriminatory but opened to all competing scenarios, both the prosecution and defence perspectives. This is because the requirement for validation emphasises the need for FSPs to validate their methods against end-user requirements—that is, the requirements of the CJS. However, as part of the criticisms of the individualised approach to validation, the evidence that the validation of methods is improving the impartiality of FSPs was challenged because of the vulnerabilities of individual FSP's perceiving their end-user as either the prosecution or defence. This makes it difficult not to believe that some individual FSPs could validate their methods and procedures without determining what results may be delivered under alternative competing conditions.

The more FSPs continue to think their methods and procedures are to deliver services to suit what a particular customer 'wants'—either the prosecution or defence—instead of what a customer 'needs' or the requirements of the CJS as a whole, the less validation can bring clarity about the fitness and the insusceptibility to bias of the different methods and procedures which co-exist across the forensic science landscape. It may be possible that the courts may not be aware of certain biases and limitations of the different forensic science methods that are used across police forces and private FSPs and the implications for the significance of test results and conclusions.

7.2.3 Best value for money, timescales and meeting operational needs

It was clear, from both the document analysis and the interview data that the FSR role does not have any input into the procurement of forensic science services in the marketplace, and, so has limited influence over cost (best value) or timescales of forensic service delivery. Rather, police commissioning and procurement of forensic science and the use of SFR aim to deliver these objectives. Instances were given which show how these objectives are being met. It was obvious to all the participants that due to cuts to police budget for forensic science, price-sensitive forensic science provision has become a "requirement" across both police in-house and private FSPs. These include the selective submission of evidential materials for forensic analysis, which means that evidential materials that are more relevant to progress the investigation may be focused while cutting down on submission and examination of irrelevant materials. Also, because of service delivery conditions, private FSPs may spend the minimum amount of time on forensic analysis,

contributing to the increased turnaround time for forensic service delivery and timely criminal investigation.

However, the findings indicated that these cost-saving practices and increased turnaround times for forensic analysis, as determined by police forces, are not always necessarily science-driven but are generally sought for "cheaper and cheerful" purposes. A key finding was that cuts to police's funding for forensic science encourage low-quality 'bargain basement' forensic science, including improper decision making concerning evidential items to be submitted by police forces for examination; prioritising turnaround times; poor case assessment and strategy; forensic analysis to be performed; and products to be delivered. Unfortunately, this system of forensic service provision tends to detract from the prioritising, and motivation for, continuous commitment and investment in quality and improvement. Thus, there is an apparent relationship between funding and cost interest for forensic science, and the demand and supply of both the quantity and quality forensic science services, depicting the explanation by McAndrew.[395] This is in addition to the Regulator's requirement for accreditation which adds to the financial costs of FSPs. The private FSPs complained about the cost-burden of UKAS' accreditation assessment and its negative implications on achieving a return on investment. While some participants continue to face significant financial problems, others seem to have been forced to leave the forensic market or cease providing some services.

The tendency for accreditation to become a regulatory constraint has attracted criticisms. Therefore, it was not uncommon to find in the literature where people would appreciate the contribution that appropriate laboratory regulation and inspection can make on the mitigation of risks of quality failures, and yet argue that regulation adds an unnecessary and ever-increasing cost burden on forensic laboratories that detract from the quality.[396] Aside from this, the tension between accreditation and cost incurred by FSPs was not unexpected in the interview, given that it was already acknowledged in the FSR annual reports. However, what is debatable is whether claims of excessive standard requirements set by the Regulator in themselves are at variance with achieving the best standards of quality.

Quality standards for accreditation, including the ISO 17025, are meant to be the minimum requirements for service provision and are expected to be set at a level that is optimal and yet achievable by all service providers.[397] One of the indicators for assessing the impact of quality standards is the efforts that organisations have to make to conform to quality standards and

[395] McAndrew (n 312).
[396] RJ Flanagan, 'Cut Costs at All Costs!' (2018) 290 Forensic Science International e26.
[397] Sutherland, Leatherman, and Health Foundation (Great Britain) (n 243).

accreditation, including investment costs and the bureaucracy involved in the accreditation process.[398] It was found that even though the FSR Codes apply equally to all FSPs, the cost of meeting relevant requirements differs across FSPs, based on the nature of services provided by individual FSPs. This is where problems emerge. Aside from the general experience by FSPs that UKAS' assessment is expensive, there was clear evidence that FSPs face difficulties achieving accreditation due to inadequate financial resources. Also, due to the disproportionality in financial and technical resource standing between private large-scale and small-scale FSPs and police forces, it is difficult for different FSPs to conform equally to required quality standards. Even where FSPs are able to afford accreditation, the cost may have different implications.

For instance, the evidence is available that because of pressures from commercialisation and cost minimisation interests, some police forces and private FSPs may avoid doing some 'extra' valuable practices to increase quality.[399] Thus, amid financial difficulties, highly demanding quality standard requirements may, wittingly or unwittingly, pose risks to quality by making cheaper ways of conforming to quality standard requirements more attractive. Two probable implications are that, firstly, cheaper methods and procedures may be preferred by FSPs than alternative suitable but costly ones. Secondly, FSPs could develop methods and procedures to pass accreditation but some procedures within the methods could be avoided or the number of analytical tests could be reduced to save cost.[400] The complaints about the expensive cost of UKAS' assessment and UKAS' monopoly is not, therefore, insignificant as they do echo the findings of a study which surveyed the experience of FSPs concerning accreditation.[401]

As some FSPs thought that price quotes by UKAS are "unnecessarily expensive" and "unfair", it is difficult to exempt UKAS' monopoly from the expensive cost of complying with accreditation. In the USA, multiple accreditation bodies accredit forensic science laboratories. In addition to the services offered by individual laboratories, the cost of accreditation is dependent on the accreditation body one chooses—some of whom are specialised in other forensic disciplines, have different additional requirements for accreditation and accredit other FSPs outside the USA.[402] In the UK, finding a cost-effective route for ISO 17020 accreditation for small-scale providers who provide casework review for the defence has been a priority for the FSR. However, it has not been considered whether multiple accreditation bodies to accredit FSPs could help reduce some cost associated with UKAS' monopoly.

[398] Singels, Ruël and Water (n 300).
[399] Caddy (n 385).
[400] Carson and others (n 317).
[401] The Chartered Society of Forensic Sciences (n 202).
[402] Wilson-Wilde (n 277).

7.2.4 Reflecting an understanding of the needs of the customer and CJS as a whole

There was demonstrable evidence of the regulator's positive impact on helping FSPs to achieve this objective. Particularly, the Regulator has been influential upon small-scale and sole-traded FSPs and some police forces who have gaps in accreditation. These group of FSPs explained that they apply the Regulator's requirement for 'declaration of non-compliance', as well as follow the CPR to compensate for gaps in accreditation and mitigate some potential risks. However, it was apparent that the Regulator's impact is limited, particularly because of the cost interest of police forces whose needs as the forensic 'customers' tend to override the requirement of the CJS during the commissioning and procurement of forensic science. In the interest of a forensic service provision that reflects the understanding of the requirements of the CJS, forensic examiners should be able to make good decisions concerning what evidence will be collected at the crime scene, what evidence will be submitted for analysis, and what information they will request form laboratories that can increase the chance of securing verdict.[403] However, it was found that these interests are heavily impacted by cuts to police funding and cost-saving decisions.

The data gathered about cost-saving decisions and shortcut measures of forensic service provision seem to support two conclusions. Firstly, police forces may be reluctant to submit evidence which they ought to submit for analysis due to pressure to cut costs, thereby, causing the decline in forensic services being used in the CJS. Secondly, because of price-sensitive procurement agreements, private FSPs who win contracts for service supply feel the pressure to provide cheaper, not necessarily high-quality, forensic science services. This is in addition to the adverse implications of SFR which cause problems concerning the utility and understandability of forensic science evidence by the defence and the court.[404] This means that even though cost-saving measures may be achieving best value and specific customer needs, this creates the tension for a forensic service provision that satisfies the needs of other service users, such as the defence and the court at large.

This tension, therefore, exemplifies the situation where solutions to certain problems in the complex interdependent CJS simultaneously create or exacerbate other tensions elsewhere in the system.[405] As found in this study, others have criticised the approach of forensic service provision in England and Wales where budget and economic considerations have given police forces a considerable control in dictating the meaning of forensic science and the role of forensic scientists.[406] This study, therefore, challenges the findings of a previous study which found that the

[403] King and Maguire (n 263).
[404] Edmond, Carr and Piasecki (n 319).
[405] Roberts, 'Paradigms of Forensic Science and Legal Process' (n 42).
[406] Lawless (n 101), p.73 - 76.

comprehensive spending review by police forces has resulted in improvements in the quality of the work of FSPs.[407]

Also, the impact of police contractual requirements on forensic service provision exemplifies a situation where the value and the interest of the FSR role as the quality assurance regulator appear to have been marginalised to just the laboratory setting. For instance, one of the interests of the Regulator is that the commissioning of forensic services will support the overall aims of the CJS and not solely the aims of the commissioning party.[408] Also, in the absence of a statutory basis for the FSR role, the expectation was that the Regulator will harness the support of the forensic science marketplace to develop a climate within which FSPs who do not comply with quality standards will find it difficult to secure contracts to provide forensic science services to police forces and others.[409] However, this study indicates that the opposite of this expectation seems to be happening.

Due to the general collective interests of police forces, forensic commissioning and procurement process appears to incentivise cheaper prices and quicker forensic service provision, while the Regulator faces difficulty to ensure that equal priority for quality permeates each stage of the process of forensic science service provision, from the crime scene to court. The expressions by the majority of participants that the whole system of forensic science service-provision is "on its knees" due of cuts to police forces' budget for forensic science indicate how a free-market approach to forensic service provision has been counter-productive to the purpose and interest of the FSR.[410]

7.2.5 Maintaining public confidence

Based on the data gathered, comprising both the findings of the document analysis and the semi-structured interviews with FSPs, there is not enough evidence to conclude whether or not the process of forensic service provision can secure confidence in the quality and reliability of forensic services provided to the CJS. However, the findings indicate that the capacity of the FSR role to support and enhance the work of FSPs to ensure that the forensic services they deliver, from the crime scene to court, will continuously reflect the needs of the CJS as a whole and not the demands of a specific forensic customer is limited. Even more critical, the findings show that some existing structures and processes which may have been thought to support and collaborate with the FSR role to achieve this objective rather seem to militate the Regulator's effort and the achievement of this objective more than the Regulator's effort can counteract. Funding for forensic service

[407] Bandy and Hartley (n 281).
[408] See the priorities of the FSR at: https://www.gov.uk/government/organisations/forensic-science-regulator/about
[409] Rennison, 'The Forensic Science Regulator Business Plan 2008/09 - 2010/11' (n 6), p.4.
[410] Roberts, 'What Price a Free Market in Forensic Science Services - The Organization and Regulation of Science in the Criminal Process' (n 5).

provision, both for prosecution and defence has been a significant structural failing. It is, therefore, difficult to perceive how the FSR role may improve the quality of forensic service provision, considering that the problems which endanger the quality of forensic science are more systemic and embedded within the framework of forensic service provision, which the FSR role has limited control over. Notwithstanding, there is evidence of positive regulatory impact on achieving quality-related objectives for forensic service provision, albeit, in an undoubtedly evolving manner, particularly within the laboratory setting. The perceived changes that the FSR Bill could bring, both at improving the FSR role and the quality of forensic science are discussed in the next sections.

7.3 What changes could the FSR Bill bring?

7.3.1 Increased priority, and commitment to quality and regulation

The views put forward in favour of the FSR Bill focused on the principle behind the proposed statutory regulatory powers, in particular, that they have the potential to have a "significant impact" on the accreditation of police forces. It was agreed that, with investigative and sanctioning powers, the Regulator will have the authority to investigate FSPs and demand corrective actions for any breach of quality standards. Altogether, there is anticipation that positioning the FSR role on a statutory footing, and making regulatory requirements and recommendations legally binding, will inculcate a sense of urgency about regulation. This will, in turn, stir up a positive mindset across FSPs to prioritise quality and investment in accreditation. Unlike the current voluntary approach, it is foreseen that only by attaching penalties and sanctions to regulatory requirements, guidance and recommendations will all FSPs equally pay attention to, and comply with, regulation. However, all participants who thought that the principle behind the FSR Bill is a good idea also had reservations because of some negative impacts they perceive.

7.3.2 Statutory regulatory powers are insufficient

Opponents to the FSR bill focused on four main points. The first reservation concerned the financial implications of statutory regulatory requirements, which has the potential to close down small-scale FSPs and some police in-house forensic science activities. The views in favour of the FSR Bill sought to argue that, like the statutory regulation for FSPs who provide fingerprint and DNA analyses, the FSR Bill will increase the number of FSPs gaining accreditation. While the principle behind both statutory regulations is similar, they differ in terms of the number of forensic science areas which they cover, and for which 'mandatory' accreditation may be required. As a result, both regulations differ in terms of the cost-implications for individual FSPs. Covering a larger number of forensic science disciplines and activities, the amount of financial and technical resources, and

time that will be needed by individual FSPs to comply with accreditation under the FSR Bill will be more significant than required for the accreditation of only fingerprint bureaux. The cost implications of the FSR Bill cannot be underestimated.

Available evidence indicates that due to a late rush by police forces gaining accreditation for fingerprint bureaux because of statutory regulation, inefficiencies have been introduced across police forces.[411] This buttresses the point highlighted earlier about the impact of financial and technical resources being more significant in decisions about seeking accreditation than the accreditation itself being mandatory. Police forces and small-scale private FSPs are unable to comply fully with accreditation requirements due to financial problems and lack of well-established and effective systems in-house laboratories to support the accreditation process. It is, thus, unarguable that if the FSR Bill is enforced, it will have a significant budgetary impact on FSPs. Consequently, the Bill will increase the cost of running laboratories, will distort resource allocation of FSPs, will shift priorities towards accreditation and, simultaneously squeeze out funds for other forensic science and police investigation needs and priorities, including research and development to keep up with advancements in forensic science for continuous improvement.

Participants thought that small-scale FSPs and police forces will 'suffer' more under the FSR Bill. For the former group, it is feared that their collapse will create inequity in the provision of some specialised forensic science services and casework review for the defence. Experience demonstrates that the collapse of 'any' FSP will have negative implications on the wider CJS. When Key Forensic Services (KFS) entered administration in 2018, the negative impact included unsustainable pressure and strain on staff in private FSPs who took over the casework of KFS. Each police force was subject to a cap on evidence submissions because of insufficient capacity in the forensic science marketplace for a range of types of casework. This meant that some cases where forensic science may have provided valuable information or evidence could not be processed.[412]

The FSR Bill seems unsupported by the majority of those interviewed due to the current financial difficulties in the forensic science marketplace and how pressure from mandatory accreditation requirements or the collapse of FSPs will complicate matters. These reservations about the FSR Bill are, therefore, similar to that expressed in respect to the introduction of the Federal Crime Laboratory Reform Bill in the USA. Even though the Bill did not succeed, a study about its potential future impact found that laboratory managers opposed the bill's mandatory accreditation for fear

[411] The Forensic Science Regulator (n 138), p.2.
[412] Tully, *Forensic Science Regulator Annual Report 2018* (n 195), pp.11 – 12.

that it would see the collapse of smaller laboratories who for financial difficulties would not be able to meet the demands of mandatory accreditation.[413]

To prevent the implementation of regulatory enforcement strategies which may become redundant, regulatory reforms should be influenced by both undesirable behaviours or mischiefs which conflict with the purpose of regulation and the issues which are responsible for the mischief.[414] The second reason for opposing the FSR Bill concerned the insufficiency of the proposed statutory regulatory powers to make a significant long-term impact on the quality of forensic science because it appears to not tackle the 'real problems' which detract the quality of forensic science services. All the participants recognised that the FSR Bill which has been targeted at the problems of accreditation does not address the serious problems faced by forensic science. These include cuts to police funding for forensic science which, in turn, have been responsible for their inability to achieve the required quality standards and to deliver other operational duties. Cuts to police funding are also responsible for the problems of police commissioning of forensic science which seems to prioritise price over quality. Thus, if mandatory accreditation is enforced without accompanying adequate funding for forensic science service provision, the FSR Bill could become redundant in addressing the issues that detract from the quality of forensic science.

Also, with inadequate financial resources and workforce allocated for the FSR role, reservations appeared to point that the FSR Bill will put more pressure on the Regulator. Particularly, the investigative and sanctioning powers for the Regulator to demand time-bound corrective actions from FSPs were supported by the majority of participants, reflecting the interests and motivation of FSPs in learning lessons for improvement. However, a recurring concern was the doubt about the capacity of the Regulator to meaningfully investigate the practice of FSPs. The FSR Bill does not detail how the Regulator should conduct investigations, either in isolation or in collaboration with other agencies. However, it seems to be so that depending on the nature of cases of quality failures, the Regulator may continue to harness the support of UKAS and police forces for investigations. Even with this arrangement in place, the workforce capacity and financial resource allocation for regulation have proven inadequate to allow the successive Regulators to use resources in an effective manner that balances investigation demands and the numerous identified and emerging priorities of the FSR.[415] Providing statutory investigative powers without expanding the resource capacity of the FSR may stifle the prospect of learning lessons through investigations.

[413] Hueske and Wayland (n 286).
[414] Baldwin, Cave and Lodge (n 11), p.231.
[415] Tully, *Forensic Science Regulator Annual Report 2018* (n 195), p.8.

The third opposing view focused on the amount of authority that the FSR Bill will give to the Regulator. The FSR Bill intends for the Regulator to penalise FSPs for non-accreditation to the FSR Codes, such as the prohibition of an individual's practice. However, a judicially based concern was that prohibition of FSPs for non-accreditation will be inconsistent with the CPR concerning the admission of expert witness evidence. Part 19.4 (a) of the CPR[416] requires the expert witness' report to include the details of the experts' qualifications, relevant experience and accreditation. Also, Part 19.3(3)(c) requires the disclosure of any information which might reasonably be thought capable of undermining the reliability of the expert's opinion or detracting from the credibility or impartiality of the expert. These include lack of accreditation or other commitment to prescribed standards where that might be expected; a history of failure to observe recognised standards in the expert's area of expertise; or any adverse finding, disciplinary proceedings or other criticism about the expert, such as by the FSR.[417] Yet, the Rules and the supplementary CPD do not necessarily forbid the admission of expert evidence if accreditation has not been achieved.

Hence, providing the FSR role with powers to prohibit the practice of FSPs, and essentially preventing them from providing evidence to the CJS for non-accreditation could be a step ahead of the law. In their response to the Home Office's consultation on new statutory powers for FSR role, the views of the judiciary were that to ensure that the statutory basis is effective, it will be necessary to give the court general power to refuse to admit evidence obtained in breach of the Regulator's Code, where it would be contrary to the interests of justice to admit it. Without these arrangements, automatic exclusion of expert evidence for a breach of the FSR Code was described as "too inflexible".[418] Thus, the views of participants appear to reflect that of the judiciary, that powers for the Regulator to prohibit the practice of FSPs for non-accreditation may be disadvantageous to the interest of the CPR.

The FSR's predecessor, the CRFP, wanted to make the registration of forensic science practitioners mandatory. In doing so, it intended to convince the judiciary to make it a procedural expectation for the courts to take evidence from 'only' CRFP members.[419] Essentially, non-membership of

[416] *The Criminal Procedure Rules 2015 - No. 1490 (L. 18)*, as amended April 2018 and April 2019 (Crown copyright 2015) <http://www.legislation.gov.uk/uksi/2015/1490/pdfs/uksi_20151490_en.pdf> accessed 26 January 2018.
[417] *Criminal Practice Directions 2015 Consolidated with Amendment No.8 [2019] EWCA CRIM 495* (n 147).
[418] Judiciary of England and Wales, 'Judicial Response to the Home Office Consultation on New Statutory Powers for the Forensic Science Regulator' (2014) <https://www.judiciary.uk/wp-content/uploads/JCO/Documents/Consultations/judicial-response-to-ho-consultation-on-fsr.pdf> accessed 9 July 2020.
[419] Council for the Registration of Forensic Practitioners, 'Submission to the Forensic Science Regulator's Review of the Optimal National Approach to the Registration of Forensic Practitioners' <https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/117634/Forensic_Practitiioner_Stan1.pdf> accessed 21 November 2017.

CRFP could have carried the penalty of the prohibition of an individual's practice. However, the fundamental challenge which applies to the proposed prohibition powers for the Regulator is that the court, and no other third party, has the freedom to call any evidence or an expert witness they deem to be appropriate to any case and will not forbid the admission of evidence because FSPs fail accreditation.[420]

Even when sanctioning for quality failures, the fourth reservation about the Bill criticised any blanket suspension of FSPs due to the ripple effect this could have on the CJS. Rather, a case-by-case approach of sanctioning for persistent breaches of quality standards and demanding corrective actions was supported. This reflects the recommendation by Tontarski *et al*.[421] In any given setting, regulatory enforcement strategies should take into consideration the background of those they regulate—whether they are well or ill-intentioned or well or ill-informed about compliance with regulatory requirements.[422] This study has shown that in performing their role as the FSR, the performance of the two successive Regulators has been crucially driven by the good intentions and cooperation of FSPs and the absence of resistance towards regulation. In this context, it is feared that sanctioning powers with intent to prohibit the practice of FSPs could risk the cooperation of FSPs which will, in turn, affect the ability of the Regulator to collect and collate information about risk-causing activities across FSPs.

Regulatory interventions that seek behavioural changes in organisations should succeed if they are used skillfully and are consistent with the values and needs of organisations. On the other hand, where pressure is used, there is a high likelihood that organisations will resist, making the interventions ineffective.[423] Becker *et al.* [424] found that using facts and logic, and explaining the importance of requests and proposals in detail, are the most effective ways to convince managers of forensic science laboratories to carry out necessary tasks, even when the proposed tasks are difficult or challenging. In addition to becoming an expensive regime, huge disturbances are anticipated for the FSR Bill, because of the broad applicability of compliance notices and prohibition powers. The powers in the FSR Bill for a system of legally enforced accreditation could result in inconveniences, such that even where FSPs can comply with accreditation, the only reason would be to avoid legal penalties but not to do better than that. Thus, compliance with accreditation

[420] Jonakait (n 305).
[421] Tontarski Jr and others (n 304).
[422] Baldwin, Cave and Lodge (n 11), p.230
[423] Gary Yukl and J Bruce Tracey, 'Consequences of Influence Tactics used with Subordinates, Peers, and the Boss' (1992) 77 Journal of Applied Psychology 525.
[424] Becker, Dale and Jr (n 313).

could be achieved, yet the internally led practices across individual FSPs to improve the quality of forensic science, such as research and development, could be stifled.

There are, therefore, mixed reactions to the changes that the FSR Bill could bring to the regulation and the quality of forensic science. The benefits are uncertain, and criticisms suggest that statutory regulation could become a broadly inefficient regime which could contradict the pursuance of quality and improvement in the quality of forensic services. The perceived challenges to the FSR Bill do not completely discredit the appropriateness of the principle behind statutory enforcement of accreditation and investigation of the practice of FSPs. It is rather the enforceability of these powers that seem problematic. One participant emphasised this by saying that "*looking at things purely in terms of excellence to get the results of regulation; if you have too much regulation which isn't productive in terms of sustainability of the expertise of FSPs, then you are not achieving your aims, you may actually be contradicting your aims*." **[R05]**. The data is convincing that the FSR Bill can be effective if it is accompanied by other supportive levers for change, such as sufficient fund or grants for police forces and small-scale FSPs to support accreditation and strong support and "quality culture" from the community of FSPs.

7.4 Research question four: What about regulation needs changing or improvement?

7.4.1 Increased focus on cultural change

Participants' recommendations for changes or improvement to the FSR role pointed to the limitations of regulation concerning the prevention of practitioner misconduct and/or unethical activity which can cause high-risk quality failures. Given that such failures have at their root ethical and professional misconduct, it was emphasised that a good 'quality culture' within the community of FSPs is also equally, or more, important. A good 'quality culture' is, thus, a requirement for risk mitigation and improvement in quality. The current mechanistic approach of regulation and the desire for a more legalistic and deterrent-focussed regulation—through statutory powers—were understood to be deficient in provoking the desired cultural changes. It was found that the FSR cannot 'force' cultural changes beyond intensifying the pressure upon FSPs to comply with accreditation requirements. FSPs could then also be limited in the changes they could make to ensure strict adherence to accreditation, which, aside from being resource-intensive, breeds complacency about quality and improvement in quality.

Attempts to control the behaviour of organisations through regulation can lead to the implementation of strategies which conflict when an underlying model is unclear. Questions can remain over whether the FSR role and demand for statutory powers seek to blame, sanction, and

deter, or to support FSPs to do the 'right thing' in and create a 'just' culture. Research shows that legal models of regulation, based on enforcing rules to affect the behaviour of individuals through deterrence and threat of sanctions have limited success in avoiding major risks and adverse practices.[425] A cultural model focused on building upon individuals' ethical and professional values to create an ethical culture, has been found more effective. Also, research suggests that while strict compliance with regulation can limit the scope of activities of organisations, strict compliance with rules does not necessarily change the organisational culture.[426] The literature, thus, supports the consensus opinions of participants that for the FSR role to succeed in mitigating and reducing the risks of quality failures, cultural changes should happen from within the individual and the community of FSPs.

The recommendations included encouraging internally-led practices within and between individual FSPs, such as investment in quality management systems, innovation, research and development. Also, it was stressed that individual FSPs should select good leaders to implement internal quality checks and invest in staff professional ethics and improve individuals' confidence levels in identifying and reporting issues which affect the quality of forensic science, without blame or fear. The new Anonymous Reporting Line that has been provided for the FSR role to allow the general public and forensic science professionals to report concerns about forensic science to the Regulator may partly address this.[427] However, the effectiveness of anonymous reporting to help mitigate the risks of quality failures will depend on the timely reporting of cases, as and when they do occur.

The rejection of unannounced inspections by most participants signalled that FSPs are already under pressures, with funding and time-limited, and focussed upon casework activities. Unannounced inspections could worsen these pressures. On the other hand, increasing the co-operation and feedback mechanism between FSPs and the courts and reserving inspections for the investigation of quality failures seemed to participants an effective way of using resources. The recommendations by participants agree with the views of Rankin and Thompson[428] that regulation and accreditation of forensic science should be built into the organisational culture and individual work ethos of FSPs and not to be implemented as something onerous, something expensive, and something for everyone else.

[425] Christopher Hodges, 'Science-Based Regulation in Financial Services: From Deterrence to Culture' [2020] Oxford Legal Studies Research <https://papers.ssrn.com/abstract=3590176> accessed 15 May 2020.
[426] Georges Ugeux, 'Culture and Conduct: Beyond Regulation and Compliance' (*The Columbia Law School Blue Sky Blog*, 8 August 2016) <https://clsbluesky.law.columbia.edu/2016/08/08/culture-and-conduct-beyond-regulation-and-compliance/> accessed 15 June 2020.
[427] Tully, *Forensic Science Regulator Annual Report 2019* (n 145).
[428] Rankin and Thompson (n 302).

Chapter 8. Conclusion and Recommendation

Several recommendations aimed at mitigating and minimising the adverse impact of forensic science quality failures on the CJS have led to the creation of the FSR role in England and Wales. The FSR role aims to ensure that the provision of forensic science services across the CJS is subject to an appropriate regime of scientific quality standards. The FSR has set and monitors quality standards for the accreditation of FSPs and investigates cases of quality failures where these may occur within FSPs. This is to ensure that the work of FSPs are supported and enhanced by the Regulator's programme of work to ensure that the forensic services they provide will meet the demands of quality—that is, the needs of the CJS. However, this study found a gap in knowledge about the extent to which the regulator's programme of work and compliance with these programmes by FSPs are improving the quality of forensic service provision. Therefore, this study questioned the fitness of the FSR role in improving the quality of forensic service provision from the crime scene to court. Stakeholders' reports about the FSR role were analysed and supplemented with semi-structured interviews with FSPs who are well-acquainted with the FSR role. This qualitative approach has been able to explore and helped to understand the extent to which the FSR role is making some impact on the ground which may have been overlooked by previous quantitative assessment of regulatory effectiveness.

Overall, it was found that the FSR role has the potential to improve the quality of laboratory-based forensic practice, but it is insufficient if attempting to improve the quality of forensic sciences carried out outside the laboratory setting. This is because, the institutional framework of the FSR role is not yet properly integrated into the end-to-end process of forensic service provision, from the crime scene to court. Also, some failures in existing structures and processes, such as the forensic marketplace and SFR, which ought to support and collaborate with the FSR role to achieve quality-related objectives for forensic service provision rather seem to militate the achievement of these objectives. These failings are caused by serious economic considerations for forensic service provision which the Regulator has no control over. As a result, the FSR role and its interest in quality forensic service provision appear to be marginalised to the laboratory setting, rather than playing an intrinsic role in the overall process of forensic service provision from the crime scene to court.

8.1 Factual conclusions

The study has shown that the FSR role has been an agent for positive reform within forensic science laboratories, by developing the FSR Codes which provide a framework of quality standards for FSPs. Also, the Regulator's requirement for the validation of methods has reinforced demands for

forensic science undertaken in laboratories to be robust, by improving and assuring methods used by FSPs. Also, the investigation of quality failures and recommendations by successive Regulators have provided the opportunity for FSPs and the wider forensic science community to learn lessons from mistakes. It was also found that the internal motivation of FSPs to gain accreditation and their support for the FSR role has contributed to the positive outcomes of the FSR role. This includes the commitment by FSPs to report cases of quality failures and learn lessons. However, overall, the successes of the Regulator's role were described as a work in progress, with more room for improvement.

Regarding the limitations of the work of the Regulator, it was found that the FSR occupies a difficult position. Participants expressed that successive Regulators have had limited oversight of forensic science; they are overburdened; they have "no teeth" for enforcement, and no sanctioning powers. Besides these, the difficulties of the FSR role were attributed to other challenges, which are thought to be "bigger" than the appointed Regulator. These include the lack of money for forensic service provision and accreditation of police forces which has led to the pressure to cut corners in forensic service provision. With these challenges, it is thought that the whole forensic science sector "is on its knees". Further, participants have explained that there is a gap between the expectations for forensic science quality assurance through the FSR role and the capability of the appointed Regulator to achieve outcomes that meet expectations of the role.

In terms of the impact of the Regulator's programme of work on the practice of FSPs, it was found that individual FSPs are experiencing positive changes and/or improvement in their practice due to the implementation of some regulatory requirements and guidance. Overall, it was found that FSPs have increased confidence in their practice, because of enhanced review of forensic science testing and results; increased consistency and transparency through quality assurance methods; validation of methods; and implementation of policies to handle quality failures. Also, due to maintaining accredited systems, FSPs are confident in their ability to handle low-risk quality failures or minor non-conforming works. Even for some FSPs who have gaps in accreditation, it was found that they apply regulatory requirements to mitigate the potential risk to quality that may be associated with this gap.

Yet, the role of the FSR was criticised for its lessening focus on building in continuous improvement in the work of FSPs. Criticisms indicated that even though regulation has created a single framework of quality standards and accreditation requirements, the two successive Regulators have prioritised accreditation over improvement in the methods and techniques of FSPs. Concerns were raised about the approach of reporting cases of quality failures, where private FSPs

are thought to be doing better than police force laboratories. Further, the individual and varied approaches by which FSPs demonstrate compliance with the quality standard and validation requirements were criticised. Also, while the relationship between regulation and prevention of quality failures was found to be contentious, criticisms suggested that cases of quality failures which have occurred across some accredited FSPs indicate complacency by some FSPs towards accreditation. It was found that a blame culture and potential conflicts of interest associated with the reporting of quality failures may pose difficulties in reporting quality failures, which can also threaten the opportunities for learning lessons. Also, the expensive cost of complying with accreditation requirements was found threatening to the collapse of some FSPs.

In terms of the changes that the FSR Bill could bring, the proposed powers for the FSR to issue compliance notices seemed supported because they will give "more teeth" to the Regulator to mandate quality standards and accreditation. The implication is that this will help level the gaps in quality management systems and practices across both police forces and private FSPs. It was also found that investigation and sanctioning powers will help the Regulator to sanction FSPs and demand corrective actions for breach of quality standards. However, these positive aspirations were contraindicated with several potential negative consequences. Particularly, due to some foreseeable (significant) financial implications of compliance notices and prohibition powers, it is perceived that the FSR Bill could cause the closure of some small-scale private FSPs and police forensic science laboratories. The impact of this on the investigation of crime and the CJS would be dire. As a result, the FSR Bill is thought to be an 'iron fist', yet, insufficient reform to the FSR role that will deteriorate the internal motivation that FSPs have for accreditation, innovation, and improvement.

To recommend some practices that could improve the FSR role, it was thought that attempts to incorporate unannounced inspections of FSPs could be a good idea, in terms of improving the detection of quality failures. However, this will have negative implications for finances and time needed by FSPs for casework. On the contrary, it was recommended that shifting attention to building in a "quality culture" across FSPs and within individual forensic practitioners will be a better approach to complement the weaknesses of the FSR role in preventing high-risk quality failures which have at their root ethical and professional misconduct.

8.2 Conceptual conclusions

It emerged from the theoretical framework that selecting the benchmark to assess the effectiveness of regulation, that is—either from the input, process (compliance) or outcome-based perspective, is a matter of choice, depending on the purpose of evaluating effectiveness. This study has

ascertained the effectiveness of the FSR role across these levels. Most importantly, exploring some outcome-based impact of the FSR role on the work of FSPs has found some valuable information that may have been missed by both input and compliance-based assessment alone. The experiences and views of FSPs who experience the impact of the FSR role on the ground have challenged the ability of the Regulator both in fulfilling the role of the FSR and in improving the quality of forensic service provision from the crime scene to court. The study has identified that while the FSR role is important, it is only one determinant of the overall improvement in the quality of forensic service provision and the mitigation/minimisation of risks of quality failures—and by no means practically the most important one. Inadequate government funding is rather found to be a significant factor.

The findings indicate that the FSR role, the cost and other demand conditions of forensic service commissioning, and the activities of FSPs both inherently and in response to regulation and the conditions of forensic service commissioning impact the quality of forensic service provision in different ways. However, inadequate government funding for forensic service provision hampers the proper functioning of all these drivers of quality, that is, the ability of the Regulator to develop programmes and take actions to effect improvement in quality; for police to deliver and commission forensic services, and for private FSPs to supply services that are continuously informed by the understanding of the requirements of the CJS as a whole. This finding adds to the theoretical framework of regulatory effectiveness, indicating that the fitness of the FSR role in improving the quality of forensic services is heavily driven and, directly determined by external forces and events which the Regulator simply cannot control or address their consequences. For the lack of adequate government funding for forensic service provision, there is a gap in the role of the FSR which risks creating a false sense of security about regulating the quality of forensic service provision and could lead to failures to correct systemic issues which adversely affect the quality of forensic services.

8.3 Contribution to knowledge and recommendation

There are different definitions of 'originality' or the significant contribution of a study. However, originality should be interpreted in a subject-specific context, based on the contribution made by the research to the body of knowledge in a specific discipline. This includes the extent to which the research provides insights into and increases the understanding of the relevant field of study.[429] It is also suggested that the originality of qualitative research be demonstrated through independent critical thought, including by critical thinking about a research approach, developing a concept or

[429] Gillian Clarke and Ingrid Lunt, 'The Concept of "Originality" in the Ph.D.: How Is It Interpreted by Examiners?' (2014) 39 Assessment & Evaluation in Higher Education 803.

building on an existing study.[430] This research attempts to demonstrate an original contribution in line with these principles.

Before this study, attempts to understand the effectiveness of the FSR role had focused on examining the actions of the Regulator, projecting the assumption that the FSR role is effective because the Regulators are developing quality standards, monitoring the accreditation of FSPs and investigating some cases of quality failures. However, this approach alone had been insufficient in providing a cast-iron guarantee of quality forensic science as a result of the FSR role. Thus, because of its narrow focus, the approach for assessing the effectiveness of the FSR role may have left some aspects of the effectiveness of the FSR role not, yet, fully explored and understood or overlooked. Therefore, rather than reducing the effectiveness of the FSR role to some quantitative data points, this study has shown, for the first time, the effectiveness of the FSR role more closely at its interactions with the work of FSPs, highlighting the extent at which regulation impacts FSPs in providing forensic services that meet the requirements of the CJS.

This study has found that the impact of the FSR role on the quality of forensic service provision is limited within the laboratory setting. Pursuing and achieving quality outside this setting has been difficult because of failures of some existing structures and processes which ought to support and collaborate with the FSR role. For this reason, this study exposes the limitations of previous knowledge which had projected the lack of statutory powers for the FSR role as the significant problem for achieving quality forensic science, and, hence, the provision of statutory powers for the FSR role as the significant solution. The study has shown that the quality of forensic service provision appears to move with the tide of police funding and spending on forensic science and their cost interest as specific forensic 'customers' more than the influence of the FSR quality standard requirements. Hence, the quality forensic service provision has been more challenging for the lack of proper funding for forensic service provision than because of the lack of statutory regulatory powers for the FSR role.

The views put forward both in favour of and against the FSR Bill suggest that providing statutory powers to the FSR could tend to be "a fig leaf to cover much bigger problems in forensic science in [England and Wales]".[431] Thus, providing statutory regulatory powers for the FSR to enforce accreditation is only a partial answer which is insufficient to cure the bigger problems which significantly burden the quality of forensic service provision. The findings show that the more pressing issue for quality forensic service is how to provide sufficient funding for police forces to

[430] Silverman (n 347), p.75.
[431] Carole McCartney and Emmanuel Nsiah Amoako, 'Accreditation of Forensic Science Service Providers' (2019) 65 Journal of Forensic and Legal Medicine 143.

deliver and commission forensic services and to invest in accreditation and quality. With police forces already lacking the adequate funding to commission forensic services appropriately and to invest in and achieve accreditation on time, it will be difficult for them to make a greater commitment to quality under statutory regulation than they can do now. Even if they are able to do so, a state of affairs where only deterrence and prohibition of practice by regulation will be required to achieve results could be detrimental to the long-term pursuance of quality forensic science. A further significant contribution of this study is, therefore, the identification of new and emerging issues about the FSR Bill which require further re-evaluation and explanation before its legislation and implementation.

The anticipated negative changes associated with what appears to be the inconsiderate execution of statutory powers should help policymakers, the Regulator and FSPs to work to resolve issues before implementing the Bill rather than to react to issues if, or after, the Bill is implemented. By their support for and compliance with the FSR role; good motivation for accreditation; and commitment and responsibility to report quality failures, FSPs will be better able to increase priority for investment in accreditation and internally-led practices for improvement in quality if they are given adequate funding rather than being forced to do so through statutory enforcement. Thus, providing adequate funding for forensic science provision and increasing attention for a 'quality culture' of FSPs seems more urgent and a better solution than providing the FSR role with statutory powers to enforce accreditation and/or to prohibit the practice of FSPs for non-accreditation. The recommendation for reinforcing a 'quality culture' means increasing the shared values and a belief across the community of FSPs that ethics and quality is everyone's responsibility. This recommendation is not, necessarily, about the Regulator regulating the culture of FSPs. However, it is about the Regulator regulating through the culture of FSPs, by increasing its collaboration and support for the CSFS which spearheads ethical and professional behaviours of individual forensic science practitioners.

Another relevant recommendation is that the scope of the FSR role should be expanded to incorporate the upstream, non-laboratory, forensic science decisions and practices of police forces. Also, the workforce capacity and financial resources of the Regulator should be expanded, as well as encouraging greater involvement of other bodies, such as the courts, in the work of the Regulator. These should improve the functioning of the Regulator to ensure that areas which detract from the quality of forensic science are properly scrutinised to allow the dissemination of bespoke regulatory guidance for quality improvement. Overall, to be fit for purpose, there must be greater coordination between the role of the FSR and the operation of the forensic science marketplace and other drivers of quality forensic science. Within a stable, well-resourced and managed system of forensic service

provision, the FSR, police service contracts, the CPS and the LAA should be able to agree and insist that both police forces and private FSPs be accredited. In this manner, the forensic marketplace alone should be able to dictate further commitment for accreditation and quality among all FSPs, while the FSR role can focus on other pressing quality-related issues.

This echoes the recommendations of the most recent report on forensic science in England and Wales, which argues for reform and expansion of the Regulator's remit and resources to allow the Regulator to have responsibility for the forensic science market.[432] The extent to which funding and management problems of the forensic science marketplace overlap to affect the purpose and the interest of the FSR indicate that increasing the involvement of the FSR in the management of the forensic science marketplace and fixing the cuts to forensic science provision should forestall the trade-off between price reductions and the quality of forensic science. Overall, the factual conclusions justify the claims of the contribution to knowledge and the recommendations concerning both the FSR Bill and the fitness of the FSR role. The conclusions can be generalised to the extent that they are supported by the experiences and views of representatives from each sector of the forensic service provision.

8.4 Future study

A secondary finding of the study was that due to the diverse nature of FSPs, in terms of the services they provide, and the prerogative they have in adopting or developing methods and procedures they deem fit for a specific forensic purpose and to conform to specific standard requirements, this study is limited in concluding whether or not the FSR role has improved some discipline-specific forensic practices. It is, therefore, relevant to explore and compare the practice of FSPs to identify the sources, similarities and differences in some general and discipline-specific methods and procedures. This should help in understanding the scope of diversity of forensic science practices across the landscape of FSPs and the implications of any available diversities on the work output of FSPs, including those who provide the same forensic services. This should be the basis for determining how best the FSR role can work to resolve any available diversities and their implications and improve consistency and best forensic practices across the landscape of FSPs.

Also, due to the findings concerning the expensive cost of UKAS' accreditation scheme, a future study should seek the views of FSPs concerning whether having multiple (competing) accreditation bodies would be economical. Further, any relevant future study should improve upon the limitations of this study concerning the issues of sampling participants. As was encountered in the data collection process, some FSPs may be unwilling to participate in a study concerning the impact

[432] House of Lords Science and Technology Select Committee (n 6), p.21.

of the FSR role due to the precarious nature of the forensic marketplace. As a result, it will be beneficial for further study to utilise some innovative methods of sampling to recruit a large number of different FSPs. This should help identify some new knowledge about forensic science regulation in England and Wales that may be more representative across the diverse groups of FSPs than was experienced in this study.

Appendices

Appendix I. Ethical approval

Research Ethics: Your submission has been approved

EthicsOnline@Northumbria <EthicsOnline@Northumbria>
Tue 10/04/2018 14:48
To: emmanuel.nsiah.amoako <emmanuel.amoako@northumbria.ac.uk>

Dear emmanuel.nsiah.amoako,

Submission Ref: 4503

Following independent peer review of the above proposal*, I am pleased to inform you that **APPROVAL** has been granted on the basis of this proposal and subject to continued compliance with the University policies on ethics, informed consent, and any other policies applicable to your individual research. You should also have current Disclosure & Barring Service (DBS) clearance if your research involves working with children and/or vulnerable adults.

* note: Staff Low Risk applications are auto-approved without independent peer review.

The University's Policies and Procedures are here

All researchers must also notify this office of the following:

- Any significant changes to the study design, by submitting an 'Ethics Amendment Form'
- Any incidents which have an adverse effect on participants, researchers or study outcomes, by submitting an 'Ethical incident Form'
- Any suspension or abandonment of the study.

Please check your approved proposal for any Approval Conditions upon which approval has been made.

Use this link to view the submission: View Submission

Research Ethics Home: Research Ethics Home

Please do not reply to this email. This is an unmonitored mailbox. If you are a student, queries should be discussed with your Module Tutor/Supervisor. If you are a member of staff please consult your Department Ethics Lead.

Appendix II. Participant Information Sheet and Informed Consent Form

Dear Participant,

Forensic science regulation in England and Wales was established on the backdrop of miscarriages of justice cases which were caused by unreliable forensic science. The Forensic Science Regulator's (FSR) role aims to improve the quality of forensic service provision. This is attempted through the development of a comprehensive framework of quality standards for all forensic science providers (companies and law-enforcement bodies who provide any forensic service), practitioners (any forensic specialist or expert), and methods (forensic techniques). By establishing, and enforcing these quality standards, the FSR role is also expected to reduce the risk of quality failings which impede or prevent the identification, prosecution and conviction of offenders.

You are kindly invited to partake in this study which seeks to understand the fitness of the FSR role to improve the quality of forensic science service provision, from the crime scene to court. This research is a PhD studentship at Northumbria University's Law School and is funded by the University. The title of the research is **'Regulation of forensic science in England and Wales'**.

Research question	What is the fitness of the Forensic Science Regulator's (FSR) role in improving the quality of forensic science service provision from the crime scene to court?
Research aim	To understand the fitness of the Forensic Science Regulator's (FSR) role in improving the quality of forensic science service provision from the crime scene to court.
Research objectives	To ascertain the views of forensic practitioners and service provider organisations on; 1. Contextual and structural factors which impact the FSR role and affect the operation of the Regulator. 2. The extent to which the Regulator's quality standards requirements and interventions impact the quality of the work of FSPs. 3. Foreseeable changes that the FSR Bill could bring to the regulation and the quality of forensic service provision 4. Some potential regulatory practices for improving the model of forensic science regulation.

Interview	The interview will take approximately 45 minutes and be audiotaped and then transcribed. The interview will take place at a time, place and format that is convenient for you.
Ethics	This research has been granted ethical approval by the Northumbria University. As a result, all research activities will be conducted in strict accordance with the ethical guidelines of the University. No personal data will be required from participants, and your responses will be anonymised by coding, managed and processed for the purpose of this research, following the principles of the General Data Protection Regulation 2018. All data will be kept on a password-protected computer and locked filing cabinets (for paper works) in an office accessible to only authorised cardholders. Your confidentiality and anonymity are, therefore, strongly assured and your participation in this research is voluntary.
Research Findings	The results of this research will be presented in a thesis document submitted to the University. Findings may also be presented at conferences and in peer-reviewed journal publications, book chapters etc. Data will be presented in such a way that individual participants cannot be identified by any means.

Your participation is greatly valued, and I look forward to your cooperation.

Yours Sincerely,

Emmanuel Nsiah Amoako.

Participant Informed Consent Form

By signing this Informed Consent form, I agree that the information I provide will be held and used for the purpose of this research titled **'Regulation of forensic science in England and Wales',** and by ticking the appropriate boxes I confirm that;

1	I have read and understood the information about the project, as provided in the Participant Information Sheet	
2	I have been given the opportunity to ask questions about the study and my participation	
3	I am willing to be interviewed	
4	I am willing for my responses to be tape-recorded	
5	I understand that I can withdraw my participation at any time and that I will not be penalised nor be questioned on why I have withdrawn	
6	The use of the research data and further publications has been explained to me	
7	I am aware that my details will be kept confidential and will not appear in any printed documents	

I agree to the University of Northumbria at Newcastle recording and processing this information about me. I understand that this information will be used only for the purpose(s) set out in the information sheet supplied to me, and my consent is conditional upon the University complying with its duties and obligations under the General Data Protection Regulation 2018.

Participant's Signature: **Date:**

Researcher's signature: **Date:**

If you consent to participate in the research, you have the right to express any concerns to me or the principal supervisor at the contacts below;

Researcher: Emmanuel Nsiah Amoako; Email: emmanuel.amoako@northumbria.ac.uk Telephone: 07787874653

Principal Supervisor: Prof. Carole McCartney; Email: carole.mccartney@northumbria.ac.uk. Telephone: 01912437017

Appendix III. Interview Schedule

Interview Schedule

1. How would you describe yourself in the context of the forensic science sector?

2. How well are you conversant with the FSR role?

The role of the FSR

3. How has the FSR role performed after 10 years of existence?

4. Do you see any limitations with the role? How has that affected the operations of the appointed Regulator?

The impact of the FSR role

5. Has the FSR role made any impact on the quality of forensic sciences? In what ways?

6. What motivates you to gain accreditation?

7. Can you give an example where you took any action(s) because of any regulatory decision/action?

8. What does the FSR Codes help you to achieve and not achieve in terms of the quality of the services you provide?

9. Do you think there are sufficient incentives for people to report high-risk errors to the FSR?

10. One of the aims of the FSR is to minimise the risks of quality failures, do you see the regulation in that direction? In what ways?

The FSR Bill

11. Will the changes to the FSR – in making it a statutory body – make a difference (how?)

Recommendations

Would you recommend any changes or improvement to the FSR role?

Appendix IV. Publications and presentations derived from this study.

Journal publications

1. 'Nsiah Amoako & McCartney C. The UK Forensic Science Regulator: Fit for Purpose? (accepted manuscript), WIRES forensic science.
2. McCartney C & Nsiah Amoako E. (2019) Accreditation of Forensic Science Service Providers'. *Journal of Forensic and Legal Medicine*: 65, 143-145. https://doi.org/10.1016/j.jflm.2019.04.004
3. McCartney C & Nsiah Amoako E. (2018). The UK Forensic Science Regulator: A Model for Forensic Science Regulation? Georgia State University Law Review, 34, 945 – 981. https://readingroom.law.gsu.edu/gsulr/vol34/iss4/3.

Technical reports to parliamentary committees

1. McCartney, C. *et al*. 2019. Evidence submitted to the House of Commons Science and Technology Committee inquiry on the work of the Biometrics Commissioner and Forensic Science Regulator (WBC0004).' Retrieved from: http://data.parliament.uk/writtenevidence/committeeevidence.svc/evidencedocument/science-and-technology-committee/the-work-of-the-biometrics-commissioner-and-the-forensic-science-regulator/written/97821.pdf

2. McCartney, C. *et al*. (2018). Evidence submitted to the House of Lords Science and Technology Committee inquiry on forensic science (FRS0051).' Retrieved from: http://data.parliament.uk/writtenevidence/committeeevidence.svc/evidencedocument/science-and-technology-committee-lords/forensic-science/written/89775.pdf

Conference presentations

1. *Statutory Powers for forensic science regulation?* Law School PGR conference (online), Northumbria University. 05/2020.
2. *Regulating for forensic science quality: drivers for reporting quality-related complaints,* Faculty of Business and Law Doctoral and Research Conference, Northumbria University. 06/2019.
3. *Forensic science regulation: assessing performance?* Annual Autumn Conference, the Chartered Society of Forensic Sciences, Northampton, UK. 11/2018.
4. *Forensic Science Regulation: is it fit for purpose?* Faculty of Business and Law Doctoral and Research Conference, Northumbria University. 06/2018

5. *Forensic Science Regulation in the UK*, Science and Justice Research Interest Group seminar series, Northumbria University. 02/2018.

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